RKDF UNIVERSITY RANCHI

DIPLOMA IN MECHANICAL ENGINEERING (DIPLOMA ME)

RKDF UNIVERSITY RANCHI

DIPLOMA IN MECHANICAL ENGINEERING
(DIPLOMA ME)

2023 Onwards

RKDF UNIVERSITY RANCHI

DIPLOMA IN MECHANICAL ENGINEERING (DIPLOMA ME)

RKDF UNIVERSITY RANCHI

Credit System and Marks Distribution:-

Semester-I

SL. No.	Category	Subject Code	Subject Name	Periods			Credits	Marks Distribution				
				L	T	P		Internal	External		Total	
								Max	Max	Min	Max	Min
1	BSC	DE101	Applied Chemistry	3	0	0	3	40	60	18	100	35
2	BSC	DE102	Mathematics - I	3	0	0	3	40	60	18	100	35
3	Huminities & Social Sc. Courses	DE103	Communication Skills in English	2	0	0	2	40	60	18	100	35
4	BSC	DE104	Applied Physics	3	0	0	3	40	60	18	100	35
5	ESC	DE105	Fundamentals of Computer	2	0	0	2	40	60	18	100	35
6	ESC	DE106	Engineering Graphics	2	0	0	2	40	60	18	100	35
PRACTICAL DEMONSTRATION												
1	BSC	DE151	Applied Chemistry Lab	0	0	2	1	30	20		50	25
2	Huminities & Social Sc. Course	DE153	Communication Skills in English	0	0	2	1	30	20		50	25
3	BSC	DE154	Applied Physics Lab	0	0	2	1	30	20		50	25
4	ESC	DE155	Fundamentals of Computer Lab	0	0	2	1	30	20		50	25
5	ESC	DE156	Engineering Graphics Lab	0	0	3	1.5	30	20		50	25
6	ESC	DE157	Workshop / Manufacturing Practices Lab	0	0	3	1.5	30	20		50	25
TOTAL							**22**					

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DIPLOMA IN MECHANICAL ENGINEERING (DIPLOMA ME)

Credit System and Marks Distribution :-

Semester-II

SL. No.	Category	Subject Code	Subject Name	Periods			Credits	Marks Distribution				
				L	T	P		Internal	External		Total	
								Max	Max	Min	Max	Min
1	BSC	DE201	Mathematics – II	3	0	0	3	40	60	18	100	35
2	BSC	DE202	Applied Physics – II	3	0	0	3	40	60	18	100	35
3	ESC	DE203	Fundamentals of Electrical & Electronics Engineering	2	0	0	2	40	60	18	100	35
4	ESC	DE204	Engineering Mechanics	2	0	0	2	40	60	18	100	35
5	Huminities & Social Sc. Course	DE205	Communication Skills in EnglishII	3	0	0	3	40	60	18	100	35
PRACTICAL DEMONSTRATION												
1	BSC	DE252	Applied Physics –II Lab	0	0	2	1	30	20		50	25
2	ESC	DE253	Fundamentals of Electrical & Electronics Engineering Lab	0	0	2	1	30	20		50	25
3	ESC	DE254	Engineering Mechanics Lab	0	0	2	1	30	20		50	25
TOTAL							**16**					

2023 Onwards

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DIPLOMA IN MECHANICAL ENGINEERING (DIPLOMA ME)

Credit System and Marks Distribution:-

Semester-III

SL. No.	Category	Subject Code	Subject Name	Periods			Credits	Marks Distribution				
				L	T	P		Internal	External		Total	
								Max	Max	Min	Max	Min
1	BSC	DE301	Mathematics – III	3	0	0	3	40	60	18	100	35
2	PCC	DMEP302	Material Technology	2	0	0	3	40	60	18	100	35
3	PCC	DMEP303	Thermal Engineering	3	0	0	3	40	60	18	100	35
4	PCC	DMEP304	Strength of Material	3	0	0	3	40	60	18	100	35
5	PCC	DMEP305	Basic Mechanical Engineering	2	1	0	3	40	60	18	100	35
6	PCC	DMEP306	Manufacturing Process	3	0	0	3	40	60	18	100	35
PRACTICAL DEMONSTRATION												
1	PCC	DMEP353	Thermal Engineering Lab	0	0	2	1	30	20		50	25
2	PCC	DMEP354	Strength of Material Lab	0	0	2	1	30	20		50	25
3	PCC	DMEP355	Basic Mechanical Engineering Lab	0	0	2	1	30	20		50	25
4	PCC	DMEP356	Manufacturing Process Lab	0	0	2	1	30	20		50	25
5	IN		Summer Internship (4 weeks) after 2nd sem	0	0	4	2	30	20		50	25
TOTAL							**24**					

2023 Onwards

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DIPLOMA IN MECHANICAL ENGINEERING (DIPLOMA ME)

Credit System and Marks Distribution:-

Semester-IV

SL. No.	Category	Subject Code	Subject Name	Periods			Credits	Marks Distribution				
				L	T	P		Internal	External		Total	
								Max	Max	Min	Max	Min
1	PCC	DMEP401	Fluid Mechanics & Hydraulic Machine	3	0	0	3	40	60	18	100	35
2	PCC	DMEP402	Theory of Machine	2	0	0	2	40	60	18	100	35
3	PCC	DMEP403	Mechanical Drafting & Auto-CAD	3	0	0	3	40	60	18	100	35
4	PCC	DMEP404	Metrology & Quality Control	3	0	0	3	40	60	18	100	35
5	PEC	DMEP(E)	Program Elective-I	3	0	0	3	40	60	18	100	35
6	PEC	DMEP(E)	Program Elective-II	3	0	0	3	40	60	18	100	35
Program Elective-I (Choose any one)												
1	PEC	DMEP405 (E)	Heat Transfer	3	0	0	3	40	60	18	100	35
2	PEC	DMEP406 (E)	Automobile Engineering	3	0	0	3	40	60	18	100	35
3	PEC	DMEP407 (E)	Alternative Sources of Energy	3	0	0	3	40	60	18	100	35
Program Elective-II (Choose any one)												
1	PEC	DMEP408 (E)	CAD/CAM	3	0	0	3	40	60	18	100	35
2	PEC	DMEP409 (E)	Computer Integrated Manufacturing	3	0	0	3	40	60	18	100	35
3	PEC	DMEP410 (E)	Tool Engineering	3	0	0	3	40	60	18	100	35
PRACTICAL DEMONSTRATION												
1	PCC	DMEP451	Fluid Mechanics & Hydraulic MachineLab	0	0	2	1	30	20		50	25
2	PCC	DMEP452	Theory of Machine Lab	0	0	2	1	30	20		50	25
3	PCC	DMEP454	Metrology & Quality Control Lab	0	0	2	1	30	20			
4	PROJ		Minor Project	0	0	4	2	30	20		50	25
5			Essence of Indian Knowledge & Tradition	0	0	0	0	30	20		50	25
TOTAL							**22**					

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DIPLOMA IN MECHANICAL ENGINEERING (DIPLOMA ME)

Credit System and Marks Distribution:-

Semester-V

SL. No.	Category	Subject Code	Subject Name	Periods			Credits	Marks Distribution				
				L	T	P		Internal	External		Total	
								Max	Max	Min	Max	Min
1	PCC	DMEP501	Ad.Thermal Engineering	2	1	0	3	40	60	18	100	35
2	PCC	DMEP502	Design of Machine Elements	2	1	0	3	40	60	18	100	35
3	PCC	DMEP503	Adv.Manufacturing Process	3	0	0	3	40	60	18	100	35
4	PEC	DMEP(E)	Program Elective-III	3	0	0	3	40	60	18	100	35
5	PEC	DMEP(E)	Program Elective-IV	3	0	0	3	40	60	18	100	35
6	OEC	DMEO(E)	Open Elective-I	3	0	0	3	40	60	18	100	35
PRACTICAL DEMONSTRATION												
1	PCC	DME551	Ad. Thermal Engineering Lab	0	0	2	1	30	20		50	25
2	PCC	DME553	Adv. Manufacturing Process Lab	0	0	2	1	30	20		50	25
3	IN	DE554	Summer Internship-II (after 4th sem)	0	0	0	3	30	20		50	25
TOTAL							**23**					

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SL No	Category	Subject Code	Subject Name	Periods			Credits	Marks Distribution				
								Internal	External		Total	
				L	T	P		Max	Max	Min	Max	Min
Program Elective-III (Choose any one)												
1	PEC	DMEP50(E)	Refrigeration & AC	3	0	0	3	40	60	18	100	35
2	PEC	DMEP505(E)	Mechatronics	3	0	0	3	40	60	18	100	35
3	PEC	DMEP50(E)	Installation & Maintenance	3	0	0	3	40	60	18	100	35
Program Elective-IV (Choose any one)												
1	PEC	DMEP507(E)	Power Plant Engineering	3	0	0	3	40	60	18	100	35
2	PEC	DMEP508(E)	Hybrid Vehicles	3	0	0	3	40	60	18	100	35
3	PEC	DMEP509(E)	Material Handling System	3	0	0	3	40	60	18	100	35
Open Elective-I (Choose any one)												
1	OEC	DMEO510(E)	Solid Waste Management	3	0	0	3	40	60	18	100	35
2	OEC	DMEO511(E)	Industrial Instrumentation	3	0	0	3	40	60	18	100	35
3	OEC	DMEO512(E)	Web Technology	3	0	0	3	40	60	18	100	35

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DIPLOMA IN MECHANICAL ENGINEERING (DIPLOMA ME)

Credit System and Marks Distribution:-

Semester-VI												
SL. No.	**Category**	**Subject Code**	**Subject Name**	**Periods**			**Credits**	**Marks Distribution**				
				L	**T**	**P**		**Internal**	**External**		**Total**	
								Max	**Max**	**Min**	**Max**	**Min**
1	PCC	DME601	Industrial Management	3	0	0	3	40	60	18	100	35
2	Huminities & social Sc. Course	DME602	Entrepreneurship	3	1	0	4	40	60	18	100	35
3	Mandatory Course	DME603	Environmental Science	0	0	0	0	40	60	18	100	35
4	OEC	DMEO(E)	Open Elective-II	3	0	0	3	40	60	18	100	35
5	OEC	DMEO(E)	Open Elective-III	3	0	0	3	40	60	18	100	35
PRACTICAL DEMONSTRATION												
1	PROJ	DE554	Major Project	0	0	8	4	30	20		50	25
2	SEM	DE655	Seminar	0	0	2	1	30	20		50	25
TOTAL							**18**					

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Elective Papers for semester-VI

Open Elective-II (Choose any one)												
SL. No.	**Category**	**Subject Code**	**Subject Name**	**Periods**			**Credits**	**Marks Distribution**				
				L	**T**	**P**		**Internal**	**External**		**Total**	
								Max	**Max**	**Min**	**Max**	**Min**
1	OEC	DMEO 604(E)	Robotics	3	0	0	3	40	60	18	100	35
2	OEC	DMEO 605(E)	Green Energy Technology	3	0	0	3	40	60	18	100	35
3	OEC	DMEO 606(E)	Disaster Management	3	0	0	3	40	60	18	100	35
Open Elective-III (Choose any one)												
1	OEC	DMEO 607(E)	Repairs & Maintenance of Structures	3	0	0	3	40	60	18	100	35
2	OEC	DMEO 608(E)	Wind and Solar Energy Systems	3	0	0	3	40	60	18	100	35
3	OEC	DMEO 604(E)	Green Building & Energy Conservation	3	0	0	3	40	60	18	100	35
4	OEC	DMEO 605(E)	PLC & SCADA	3	0	0	3	40	60	18	100	35
5	OEC	DMEO 606(E)	Introduction to Artificial Intelligence	3	0	0	3	40	60	18	100	35

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DIPLOMA IN MECHANICAL ENGINEERING (DIPLOMA ME)
Diploma Engineering Semester-I
(Common to all Branches)

Course Code	**DE101**
Course Title	**Applied Chemistry**
Credits	**3 (L: 3 T: 0 P: 0)**

Course Objectives:

1. The students will acquire a foundation in chemistry of sufficient breadth and depth to enable them to understand and critically interpret the primary chemical literature.
2. The students will develop the ability to effectively communicate scientific information and research results in written and oral formats
3. The students will learn professionalism, including the ability to work in teams and apply basic ethical principles.

UNIT 1

Atomic Structure and Chemical Bonding:

Atomic Structure: Definition of atom, Fundamental particles of atom –electron, neutron, protons, Definition of Atomic no, Atomic mass no Isotopes &Isobars & their distinction with suitable examples, Bohr's and

Rutherford's theory; Definition and Shape of the orbital & distinction between orbits and orbitals, Hund's Rule, filling up the orbital's by Aufbau's principle (till Atomic no. 30) Chemical bonding: Cause of chemical bonding, types of bonds: electrovalent, covalent and coordinate bonds, formation of electrovalent & covalent compounds Eg. NaCl, CaCl2, CO2, Cl2, NH3, C2H4, N2, C2H2, etc., coordination bond in NH4+, and anomalous properties of NH3, HO2 due to hydrogen bonding, and metallic bonding, Octet rule, Duplet rule.

UNIT 2

Water and Corrosion:

Water: Characteristics, Sources, Impurities, Hard & Soft Water, Causes of Hardness, Types of Hardness, Degree of Hardness, Boiler and Steam Generation, Scale & Sludge Formation – Causes, Disadvantage, Softening Methods such as Boiling, Clark's, Soda Ash, Lime Soda, Zeolite & Ion

Exchange Methods with Principle Chemical Reactions. Plumbo solvency & its Removal. Numerical Problems. Corrosion: Definition of Corrosion, Types of Corrosion (Dry and Wet chemical Corrosion) and their mechanism. Protection of metal from corrosion (Corrosion Control). Application of Protective Coatings like metal coating such as Galvanizing, Tinning, Metal Spraying, Sherardizing, Electroplating and Metal Cladding.

UNIT 3

Electrochemistry and Electrochemical Cells:

Electrochemistry: Definition of terms: Conductors, Insulators, Dielectrics, Electrolyte, Non-Electrolyte, Electrolysis, Electrolytic Cell with suitable examples, Electrolytic dissociation, Arrhenius Theory of Ionization, Degree of Ionization & factors affecting degree of ionization. Redox reactions. Faradays laws of electrolysis and simple numerical problems. Electrochemical cells: Concept of electrode potential such as reduction potential & oxidation potential. Electrochemical Series, Electrolysis of CuSO4 Solution by using Cu Electrode & Platinum Electrode, Electrochemical Cells & Batteries, Definition, types such as Primary & Secondary Cells & their examples.

UNIT 4

Lubricants and Fuels:

Lubricants: Definition, Classification with examples. Functions of lubricant, Lubrication - Mechanism of Lubrication (Fluid Film, Boundary and Extreme Pressure). Physical Characteristics of Lubricants Such as Viscosity, Viscosity Index, Oiliness, Volatility, Flash & Fire Point, and Cloud & Pour Point, Chemical Characteristics such as Acid Value or Neutralization Number, Emulsification, Saponification Value, Selection of Lubricants, Characteristics of Transformer oil Fuels: Definition and combustion of fuel, classification of

fuels, calorific values (HCV and LCV), calculation of HCV and LCV using Dulong's formula. Proximate analysis of coal solid fuel petrol and diesel - fuel rating (octane and cetane numbers), Chemical composition, calorific values and applications of LPG, CNG, water gas, coal gas, producer gas and biogas.

UNIT 5

Metals and Non - Metallic Materials:

Metals: Occurrence of Metal such as Iron, Aluminum, Chromium, Nickel, Tin, their properties Definition of Metallurgy Mineral, Ore Gangue Flux & Slag, stages of Extraction of metal from Its Ores in detail. Alloys: definition of alloy, purposes of making alloy. preparation methods, General Principal of metallurgy, minerals/ ores, ore dressing, roasting, smelting, bessemerization, fluxes, purification. Explanation of alloying purposes, methods of preparation, composition and uses of alloy like brass, bronze, duralumin, German silver, gun metal, solder, stainless steel, casting and bearing alloy. Nonmetallic materials: Definition of Polymers, formation of Polymers by Addition & condensation polymerization. Properties and uses of PVC, polyethene, polystyrene, polyamides, polyesters, Bakelite. Synthetic fibers – nylon, rayon, decron, and polyesters. Natural Rubber rubber its processing and drawbacks, vulcanization of rubber with chemical reaction, synthetic rubber, definition & distinction between natural &synthetic rubber Thermal insulating material : definition & characteristics of thermal insulator. Preparation, properties & application of thermocol & glass wool Properties & application of Asbestos cork

Text Books:

1. Text Book of Chemistry for Class XI& XII (Part-I, Part-II); N.C.E.R.T., Delhi, 2017-18. TEXT

Reference Books

1. Engineering Chemistry Jain & Jain, Dhanpat Rai and Sons**;** New Delhi, 2015
2. Engineering Chemistry S. S. Dara & Dr.S.S.Umare, S. Chand Publication; New Delhi, 2015.
3. Industrial Chemistry B. K. Sharma, Goel Publication
4. Engineering Chemistry By O P Agarwal (Khanna Publication)
5. Environmental Chemistry & Pollution Control S. S. Dara, S. Chand Publication
6. Chemistry for Engineers Agnihotri, Rajesh, Wiley India Pvt. Ltd., 2014.
7. Engineering Chemistry Rao and Agarwal
8. Engineering Chemistry P.C. Jain
9. Applied Chemistry H.N. Sahni
10. Polytechnic Chemistry Vedprakash Mehta, Jain brothers.
11. Engineering Chemistry Uppal

Course Outcomes:

1. Students will be able to do when they successful complete a learning experience whether it is project, course or program

Typically, we divide their course into smaller units such. Modules, mapwork, flowchart etc

As a, general rules applied, as the level of analysis becomes smaller, from courses to module to assignment. Students will be able to function as a member of an interdisciplinary problems solving team. Students will be appreciate the central role of chemistry in our society and we use this as a basis for ethical behavior in issues facing chemists including an understanding of safe handling of chemical, environmental issues and key issues facing our society in energy health and medicine.

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DIPLOMA IN MECHANICAL ENGINEERING (DIPLOMA ME)
Diploma Engineering Semester-I

(Common to all Branches)

Course Code	**DE151**
Course Title	**Applied Chemistry Lab**
Credits	**1 (L: 0 T: 0 P: 2)**

List of Experiments:

1. Determination of Total hardness by EDTA method.
2. Determination of Total hardness by Clarke's method.
3. Determination of Flash & Fire Points by Pensky Marten Apparatus.
4. Determination of Flash & Fire Points by by Abel's Apparatus.
5. Determination of Viscosity and Viscosity index by Redwood viscometer No.1.
6. Determination of Viscosity and Viscosity index by Redwood viscometer No.2.
7. Determination of percentage of Copper in Brass by Iodometric Titration.
8. To prepare a solution of N/20 sodium carbonates and find the strength of HCl using N/20 sodium carbonate solution.

Reference Books:

1. Applied Chemistry Laboratory Practices Vol. I and Vol. II, Dr. G. H. Hugar & Prof A. N. Pathak, NITTTR, Chandigarh, Publications, 2013-14. LAB

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DIPLOMA IN MECHANICAL ENGINEERING (DIPLOMA ME)
Diploma Engineering Semester-I

(Common to all Branches)

Course Code	**DE102**
Course Title	**Mathematics-I**
Credits	**3 (L: 3 T: 0 P: 0)**

UNIT-I

Trigonometry: Concept of angles, measurement of angles in degrees, grades and radians and their conversions, T-Ratios of Allied angles (without proof), Sum, difference formulae and their applications (without proof). Product formulae (Transformation of product to sum, difference and vice versa). T- Ratios of multiple angles, sub-multiple angles (2A, 3A, A/2). Graphs of sin x, cos x, tan x and e^x

UNIT – II

Differential Calculus: Definition of function; Concept of limits. Four standard limits:
Differentiation by definition of sinx and cosx, tan x, logx Differentiation of sum, product and quotient of functions. Differentiation of function of a function. Differentiation of trigonometric a inverse trigonometric functions, Logarithmic differentiation, Exponential functions.

UNIT-III

Algebra: Complex Numbers: Definition, real and imaginary parts of a Complex number, polar and Cartesian, representation of a complex number and its conversion from one form to other, conjugate of a complex number, modulus and amplitude of a complex number Addition, Subtraction, Multiplication and Division of a complex number. De-Movier's Theorem, its application.

UNIT – IV

Partial fractions: Definition of polynomial fraction proper & improper fractions and definition of partial fractions. To resolve proper fraction into partial fraction with denominator containing non-repeated linear factors, repeated linear factors and irreducible non-repeated quadratic factors. To resolve improper fraction into partial fraction

UNIT – V

Permutations and Combinations: Value of nPr and nCr

Binomial theorem: Binomial theorem (without proof) for positive integral index (expansion and general form); binomial theorem for any index (expansion without proof) first and second binomial approximation with applications to engineering problems.

Reference Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, New Delhi, 40th Edition, 2007.
2. G. B. Thomas, R. L. Finney, Calculus and Analytic Geometry, Addison Wesley, 9th Edition, 1995.
3. Reena Garg, Engineering Mathematics, Khanna Publishing House, New Delhi (Revised Ed. 2018)
V. Sundaram, R. Balasubramanian, K.A. Lakshminarayanan, Engineering Mathematics, 6/e., Vikas Publishing House.

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DIPLOMA IN MECHANICAL ENGINEERING (DIPLOMA ME)
Diploma Engineering Semester-I

(Common to all Branches)

Course Code	**DE103**
Course Title	**Communication skills in English**
Credits	**2 (L: 2 T: 0 P: 0)**

UNIT -1

Application of Grammar, Verbs Tense. Do as directed (active/passive, Direct/ Indirect, affirmative/ Negative/ Assertive/ Interrogative, Question tag, remove too, use of article, preposition, conjunction, punctuation). Correct the errors from the sentences. Vocabulary Building (Synonyms/ Antonyms/ Homophones/ Use of contextual word in given paragraph)

UNIT-2

Introduction to communication Definition, Communication cycle Concept of Communication Process Formal Communication Formal: Types- a) Vertical Communication b) Horizontal Communication Informal: Types- Diagonal Communication Verbal Vs Non-Verbal Communication.

Verbal: Types a) Oral Communication b) Written Communication Non-Verbal: Types a) Body Language b) Graphic Language

UNIT-3

Principal of Effective Communication. Principal of Effective Communication, Communication barriers and how to overcome them.

UNIT-4

Developing Effective message: Thinking about purpose, knowing the audience, structuring the message, selecting proper channels, minimize barriers and facilitating feedback. (Example: Writing articles for newspapers, magazines).

Suggested books:

1. Contemporary English Grammar Structures and Composition; David Green, Macmillan
2. English Grammar and composition; R. C. Jain, Macmillan
3. Effective Technical Communication; M. Ashraf Rizvi, Tata McGraw Hill Companies
4. Developing communication Skills; Krushna Mohan, Meera Baneji, Macmillan.

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DIPLOMA IN MECHANICAL ENGINEERING (DIPLOMA ME)
Diploma Engineering Semester-I

(Common to all Branches)

Course Code	**DE104**
Course Title	**Applied physics-I**
Credits	**3 (L: 3 T: 0 P: 0)**

Course Objectives:

Couse objectives- study of applied physics aims to give an understanding of physical world by observation and predictions. The course help diploma engineers to apply the basic concepts and principles to solve engineering problems and to understand different technology-based application.

Unit -1

Physical world, Units and Measurements: Physical quantities; fundamental and derived, Units and systems of units (FPS, CGS and SI units), Dimensions and dimensional formulae of physical quantities, Principle of homogeneity of dimensions, Dimensional equations and their applications (conversion from one system of units to other, checking of dimensional equations and derivation of simple equations), Limitations of dimensional analysis. Measurements: Need, measuring instruments, least count, types of measurement (direct, indirect), Errors in measurements (systematic and random), absolute error, relative error, error propagation, error estimation and significant figures.

Unit-2

Force and Motion: Scalar and Vector quantities – examples, representation of vector, types of vectors. Addition and Subtraction of Vectors, Triangle and Parallelogram law (Statement only), Scalar and Vector Product, Resolution of a Vector and its application to inclined plane and lawn roller. Force, Momentum, Statement and derivation of conservation of linear momentum, its applications such as recoil of gun, rockets, Impulse and its applications. Circular motion, definition of angular displacement, angular velocity, angular acceleration, frequency, time period, Relation between linear and angular velocity, linear acceleration and angular acceleration (related numerical), Centripetal and Centrifugal forces with live examples, Expression and applications such as banking of roads and bending of cyclist.

Unit-3

Work, Power and Energy: Work Concept and units, examples of zero work, positive work and negative work Friction: concept, types, laws of limiting friction, coefficient of friction, reducing friction and its engineering applications, Work done in moving an object on horizontal and inclined plane for rough and plane surfaces and related applications. Energy and its units, kinetic energy, gravitational potential energy with examples and derivations, mechanical energy, conservation of mechanical energy for freely falling bodies, transformation of energy (examples). Power and its units, power and work relationship, calculation of power (numerical problems)

Unit-4

Rotational Motion: Translational and rotational motions with examples, Definition of torque and angular momentum and their examples, Conservation of angular momentum (quantitative) and its applications. Moment of inertia and its physical significance, radius of gyration for rigid body, theorems of parallel and perpendicular axes (statements only), Moment of inertia of rod, disc, ring and sphere (hollow and solid); (Formulae only).

Unit-5

Properties of Matter: Elasticity: definition of stress and strain, moduli of elasticity, Hooke's law, significance of stress-strain curve. Pressure: definition, units, atmospheric pressure, gauge pressure, absolute pressure, Fortin's Barometer and its applications. Surface tension: concept, units, cohesive and adhesive forces, angle of contact, Ascent Formula (No derivation), applications of surface tension, effect of temperature and impurity on surface tension. Viscosity and coefficient of viscosity: Terminal velocity, Stoke's law and effect of temperature on viscosity, application in hydraulic systems. Hydrodynamics: Fluid motion, stream line and turbulent flow, Reynold's number Equation of Continuity, Bernoulli's Theorem (only formula and numerical) and its applications.

Heat and Thermometry: Concept of heat and temperature, modes of heat transfer (conduction, convection and radiation with examples), specific heats, scales of temperature and their relationship, Types of Thermometers (Mercury thermometer, Bimetallic thermometer, Platinum resistance thermometer, Pyrometer) and their uses. Expansion of solids, liquids and gases, coefficient of linear, surface and cubical expansions and relation amongst them, Co-efficient of thermal

conductivity, engineering applications.

Text Books:

1. Text Book of Physics for Class XI& XII (Part-I, Part-II); N.C.E.R.T., Delhi

Reference Books:

1. Applied Physics, Vol. I and Vol. II, TTTI Publications, Tata McGraw Hill, Delhi.
2. Concepts in Physics by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi
3. Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi
4. Engineering Physics by DK Bhhatacharya & Poonam Tandan; Oxford University Press, New Delhi

Course Outcomes:

After undergoing this subject, the students will be able to-

1. Identify physical quantity, select their units for engineering solutions and make measurement with accuracy.
2. Describe the different forms of energy, methods of transfer of energy.
3. Represent the physical quantity as scalar and vectors to solve real life relevant problems.
4. Analyze the type of motion and apply the formulation to understand banking pf road and conservation of momentum, recoil of gun etc.
5. Describe the concept of work, energy and power with their units and derive the relationship for work energy and power.

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DIPLOMA IN MECHANICAL ENGINEERING (DIPLOMA ME)
Diploma Engineering Semester-I

(Common to all Branches)

Course Code	**DE154**
Course Title	**Applied Physics-I Lab**
Credits	**1 (L: 0 T: 0 P: 2)**

Course objectives-

The course aims to supplement the factual knowledge gained in the lecture by first hand manipulation of apparatus. This will develop scientific temper and help student to apply the basic concepts in solving engineering and technology-based problems. In addition, students geta confidence in handling equal and thus learn skill of measurements.

List of Practical:

1) To measure the length, radius of a given cylinder, a test tube using vernier caliper and find the volume of each object.
2) To determine the diameter of a wire, a solid ball using screw gauge. 3) To Verify the Ohm's law
4) To verify the Kirchhoff's law (kvl ans kcl)
5) To find the surface tension of a liquid by capillary rise method.
6) To determine the viscosity of a given liquid (Glycerin) by Stoke's law.
7) To verify the law of conservation of mechanical energy.
8) To measure the room temperature of hot bath using mercury Thermometer and convert it into different scale.
9) To determine the radius of curvature of concave and convex mirror using spherometer.
10) Determine the force constant using Hook's law.

Course Outcomes:

After undergoing this lab work, students will be able to -

1. Select the right kind of measuring tools (meter scale, screw gauge, vernier calipers etc)
2. Describe and verify the Hook's law and determine the force constant of a spring body.
3. Understand the Stoke's law and determine the viscosity of a given liquid.
4. Understand the use of thermometer to measure the temperature under different conditions and

scales.

5. Understand the current and voltage relationship.

Reference Books:

1. Applied Physics, Vol. I and Vol. II, TTTI Publications, Tata McGraw Hill, Delhi.
2. Concepts in Physics by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi
3. Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi
4. Engineering Physics by DK Bhhatacharya & Poonam Tandan; Oxford University Press, New Delhi

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DIPLOMA IN MECHANICAL ENGINEERING (DIPLOMA ME)
Diploma Engineering Semester-I

(Common to all Branches)

Course Code	**DE105**
Course Title	**Fundamentals of Computer**
Credits	**2(L: 2 T: 0 P: 0)**

Unit- 1

Basic Internet skills: Understanding browser, efficient use of search engines, awareness about Digital Indie portals (state and national portals) and college portals. General understanding of various coin puter hard ware Com ponents — CPU, Memory, Display, Keyboard, Mouse, HDD and other Peripheral Devices.

Unit- 2

OS lnstallation (Linux and MS Windows), Unix Shell and Commands, vi editor.

HTML4, CSS, making basic personal webpage.

Unit- 3

Unit- 4

Office Tools: Open Office Writer, Open Office Sprcadsheet (Calc), Open Office Impress.

Unit-5

Information security best practices. Class lectures will only introduce the topic or demonstrate tool,actual learning will take place in the Lab by practicing

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DIPLOMA IN MECHANICAL ENGINEERING (DIPLOMA ME)
Diploma Engineering Semester-I

(Common to all Branches)

Course Code	**DE106**
Course Title	**Engineering Graphics**
Credits	**2(L: 2 T: 0 P: 0)**

UNIT – I

Basic elements of Drawing: Drawing Instruments and supporting materials: method to use them with applications. Convention of lines and their applications. Representative Fractions – reduced, enlarged and full size scales; Engineering Scales such as plain and diagonal scale. Dimensioning techniques as per SP-46:2003 – types and applications of chain, parallel and coordinate dimensioning. Geometrical and Tangency constructions. (Redraw the figure)

UNIT – II

Orthographic projections: Introduction of projections-orthographic, perspective, isometric and oblique: concept and applications. (No question to be asked in examination). Introduction to orthographic projection, First angle and Third angle method, their symbols. Conversion of pictorial view into Orthographic Views – object containing plain surfaces, slanting surfaces, slots, ribs, cylindrical surfaces. (use First Angle Projection method only)

UNIT – III

Isometric Projections: Introduction to isometric projections. Isometric scale and Natural scale. Isometric view and isometric projection. Illustrative problems related to objects containing lines, circles and arcs shape only. Conversion of orthographic views into isometric view/projection.

UNIT – IV

Free Hand Sketches of engineering elements: Free hand sketches of machine elements: Thread profiles, nuts, bolts, studs, set screws, washer, locking arrangements. (For branches other than mechanical Engineering, the

teacher should select branch specific elements for free hand sketching) Free hand sketches of orthographic view (on squared graph paper) and isometric view (on isometric grid paper)

UNIT – V

Computer aided drafting interface: Computer Aided Drafting: concept. Hardware and various CAD software available. System requirements and understanding the interface. Components of AutoCAD software window: Title bar, standard tool bar, menu bar, object properties tool bar, draw tool bar, modify tool bar, cursor cross hair. Command window, status bar, drawing area, UCS icon. File features: new file, Saving the file, opening an existing drawing file, Creating templates, Quit. Setting up new drawing: Units, Limits, Grid, Snap. Undoing and redoing action.

Unit – VI

Computer aided drafting: Draw basic entities like Line, Circle, Arc, Polygon, Ellipse, Rectangle, Multiline, Poly Line. Method of Specifying points: Absolute coordinates, Relative Cartesian and Polar coordinates. Modify and edit commands like trim, extend, delete, copy, offset, array, block, layers. Dimensioning: Linear, Horizontal Vertical, Aligned, Rotated, Baseline, Continuous, Diameter, Radius, Angular Dimensions. Dim scale variable.

Editing dimensions. Text: Single line Text, Multiline text. Standard sizes of sheet. Selecting Various plotting parameters such as Paper size, paper units, Drawing orientation, plot scale, plot offset, plot area, printpreview.

Reference Books:

1. Bhatt, N. D. *Engineering Drawing*, Charotar Publishing House, Anand, Gujrat 2010; ISBN: 978-93- 80358-17-8
2. Dhawan, R. K. *Engineering Drawing*. S. Chand and Company, New Delhi; ISBN: 81-219-1431-0.

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DIPLOMA IN MECHANICAL ENGINEERING (DIPLOMA ME)
Diploma Engineering Semester-I

(Common to all Branches)

Course Code	**DE157**
Course Title	**Workshop/Manufacturing Practices Lab**
Credits	**1.5(L: 0 T: 0 P: 3)**

Details of Practical Content:

1. Carpentry:

(i) Demonstration of different wood working tools / machines.

(ii) Demonstration of different wood working processes, like plaining, marking, chiseling, grooving, turning of wood etc.

(iii) One simple job involving any one joint like mortise and tenon dovetail, bridle, half lap etc.

2. Fitting:

(i) Demonstration of different fitting tools and drilling machines and power tools

(ii) Demonstration of different operations like chipping, filing, drilling, tapping, sawing, cutting etc.

(iii) One simple fitting job involving practice of chipping, filing, drilling, tapping, cutting etc.

3. Welding:

(i) Demonstration of different welding tools / machines.

(ii) Demonstration on Arc Welding, Gas Welding, MIG, MAG welding, gas cutting and rebuilding of broken parts with welding.

(iii) One simple job involving butt and lap joint.

4. Sheet Metal Working:

(i) Demonstration of different sheet metal tools / machines.

(ii) Demonstration of different sheet metal operations like sheet cutting, bending, edging, end curling, lancing, soldering, brazing, and riveting.

(iii) One simple job involving sheet metal operations and soldering and riveting.

5. Electrical House Wiring:

(i) Practice on simple lamp circuits

(ii) One lamp controlled by one switch by surface conduit wiring,

(iii) Lamp circuits- connection of lamp and socket by separate switches,

(iv) Connection of Fluorescent lamp/tube light,

(v) simple lamp circuits-install bedroom lighting.

(vi) Simple lamp circuits- install stair case wiring.

6. Demonstration:

(i) Demonstration of measurement of Current, Voltage, Power and Energy.

(ii) Demonstration of advance power tools, pneumatic tools, electrical wiring tools and accessories.

(iii) Tools for Cutting and drilling

References:

1. S.K. Hajara Chaudhary, Workshop Technology, Media Promoters and Publishers, New Delhi, 2015
2. B.S. Raghuwanshi, Workshop Technology, Dhanpat Rai and sons, New Delhi 2014
3. K. Venkat Reddy, Workshop Practice Manual, BS Publications, Hyderabad

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DIPLOMA IN MECHANICAL ENGINEERING (DIPLOMA ME)
Diploma Engineering Semester-II

(Common to all Branches)

Course Code	**DE202**
Course Title	**Applied Physics-II**
Credits	**3(L: 3 T: 0 P: 0)**

Course Objectives:

Applied physics aims to gives an understanding of this world both by observation and prediction of the way in which the object behaves; this course helps the student to solve board-based engineering problems.

Unit – 1

Wave motion and its applications:

Wave motion, transverse and longitudinal waves with examples, definitions of wave velocity, frequency and wave length and their relationship, Sound and light waves and their properties,

Wave equation, Amplitude, Phase, Phase difference, principle of superposition of waves and beat formation. Simple Harmonic Motion (SHM): definition, expression for displacement, velocity, acceleration, time period, frequency etc. Simple harmonic progressive wave and energy transfer, study of vibration of cantilever and determination of its time period, Free, forced and resonant vibrations with examples.

Acoustics of buildings – reverberation, reverberation time, echo, noise, coefficient of absorption of sound, methods to control reverberation time and their applications, Ultrasonic waves – Introduction and properties, engineering and medical applications of ultrasonic.

Unit – 2

Optics: Basic optical laws; reflection and refraction, refractive index, Images and image formation by mirrors, lens and thin lenses, lens formula, power of lens, magnification and defects. Total internal reflection, Critical angle and conditions for total internal reflection, applications of total internal reflection in optical fiber. Optical Instruments; simple and compound microscope, astronomical telescope in normal adjustment, magnifying power, resolving power, uses of microscope and telescope, optical projection systems.

Unit – 3

Electrostatics: Coulombs law, unit of charge, Electric field, Electric lines of force and their properties, Electric flux, Electric potential and potential difference, Gauss law: Application of Gauss law to find electric field intensity of straight charged conductor, plane charged sheet and charged sphere. Capacitor and its working, Types of capacitors, Capacitance and its units. Capacitance of a parallel plate capacitor, Series and parallel combination of capacitors (related numerical), dielectric and its effect on capacitance, dielectric break down.

Unit – 4

Current Electricity: Electric Current and its units, Direct and alternating current, Resistance and its units, Specific resistance, Conductance, Specific conductance, Series and parallel combination of resistances. Factors affecting resistance of a wire, carbon resistances and colour coding. Ohm's law and its verification, Kirchhoff's laws, Wheatstone bridge and its applications (slide wire bridge only), Concept of terminal potential difference and Electro motive force (EMF) Heating effect of current, Electric power, Electric energy and its units (related numerical problems), Advantages of Electric Energy over other forms of energy.

Unit – 5

Electromagnetism: Types of magnetic materials; dia, para and ferromagnetic with their properties, Magnetic field and its units, magnetic intensity, magnetic lines of force, magnetic flux and units, magnetization. Concept of electromagnetic induction, Faraday's Laws, Lorentz force (force on moving charge in magnetic field). Force on current carrying conductor, force on rectangular coil placed in magnetic field. Moving coil galvanometer; principle, construction and working, Conversion of a galvanometer into ammeter and voltmeter.

Semiconductor Physics: Energy bands in solids, Types of materials (insulator, semi- conductor, conductor), intrinsic and extrinsic semiconductors, p-n junction, junction diode and V-I characteristics, types of junction diodes. Diode as rectifier – half wave and full wave rectifier (centre taped). Transistor; description and three terminals, Types- pnp and npn, some electronic applications (list only). Photocells, Solar cells; working principle and engineering applications.

Text Books:

Text Book of Physics for Class XI& XII (Part-I, Part-II); N.C.E.R.T., Delhi

Reference Books:

Applied Physics, Vol. I and Vol. II, TTTI Publications, Tata McGraw Hill, Delhi Concepts in Physics by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi

Course Outcomes:

After undergoing through syllabus, the students will be able to

1) Explain the wave motion, simple harmonic motion, polarization of wave etc.
2) Explain the ultrasonic waves and engineering, medical and industrial application of ultra sound.
3) Apply the knowledge of diodes, led, power adapters in electronic circuit.
4) Explain the current as flow of charge, concept power and resistance. Etc.
5) Express the nano science and technique and their effects on nanosecond and science and their impact on society. Etc.

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DIPLOMA IN MECHANICAL ENGINEERING (DIPLOMA ME)
Diploma Engineering Semester-II

(Common to all Branches)

Course Code	**DE203**
Course Title	**Fundamental of Electrical & Electronics Engineering**
Credits	**3(L: 3 T: 0 P: 0)**

Course Objectives:

1. To familiarize students with basic electrical and electronic components and their functions
2. To make the students aware with AC and DC circuits and their analysis.

Unit-I

Overview of Electronic Components & Signals: Passive Active Components: Resistances, Capacitors, Inductors, Signals: DC/AC, voltage/current, periodic/non-periodic signals, average, rms, peak values, different types of signal waveforms, Ideal/non-ideal voltage/current sources, independent/dependent voltage current sources.

Unit- II

Diodes, Transistors, FET, MOS and CMOS and their Applications, Overview of Digital Electronics: Introduction to Boolean Algebra, Electronic Implementation of Boolean Operations, OP AMP 741

Unit- III

Electric and Magnetic Circuits: EMF, Current, Potential Difference, Power and Energy; M.M.F, magnetic force, permeability, hysteresis loop, reluctance, leakage factor and BH curve; Electromagnetic induction, Faraday's laws of electromagnetic induction, Lenz's law

Unit-IV

A.C. Circuits: Cycle, Frequency, Periodic time, Amplitude, Angular velocity, RMS value, Average value, Form Factor Peak Factor, impedance, phase angle, and power factor; Mathematical and phasor representation of alternating emf and current; Voltage and Current relationship in Star and Delta connections; A.C in resistors, inductors and capacitors; A.C in R-L series, R-C series, R-L-C series and parallel circuits; Power in A. C. Circuits, power triangle, Introduction Overview and applications of Electrical Machines DC Motor, DC Generator, AC Generator, Induction Motor and

Transformer.

Text Books:

1. Basic Electrical Engineering I.J. Nagrath and D.P. Kothari, 2nd Edition, TMH, Delhi.
2. Basic Electrical Engineering by UA Bakshi and AV Bakshi Technical Publications Pune.

Reference Books:

1. Ritu Sahdev, Basic Electrical Engineering, Khanna Publishing House
2. Mittle and Mittal, Basic Electrical Engineering, McGraw Education, New Delhi, 2015, ISBN:978-0-07-0088572-5
3. Saxena, S. B. Lal, Fundamentals of Electrical Engineering, Cambridge University Press, latest edition ISBN: 9781107464353

Course Outcomes:

After completing the course students will be able to

1. Discuss about basic electrical and electronic devices
2. Solve network problems of AC and DC circuits
3. Can design basic analog and digital circuits.

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DIPLOMA IN MECHANICAL ENGINEERING (DIPLOMA ME)
Diploma Engineering Semester-II

(Common to all **Branches)**

Course Code	**DE253**
Course Title	**Fundamental of Electrical & Electronics Engineering Lab**
Credits	**1(L: 0 T: 0 P: 2)**

Course Objectives:

1. To make the students able to do design and make connection for basic electrical circuit.
2. To enable students to verify the characteristics of the electrical and electronic circuits practically
3. To have sound practice of electrical safety.

List of Experiments

1. To study the various components of Electrical and Electronics.
2. To determine the stated value of a resistor by interpreting the color code indicated on the resistor.
3. To measure resistance using ohmmeter
4. To study and verify the series and parallel Circuit.
5. To study and plot V-I Characteristics of Silicon P-N Junction Diode.
6. To study the dependence of current on the potential difference across a resistor and determine its resistance. Also plot a graph between V and I.
7. To study the Inverting Amplifier and Non-Inverting Amplifier op-amp circuits.
8. To study the basic logic gates: AND, OR, NOT
9. To Study the Characteristics of Half – Wave Rectifier.
10. To study the Characteristics of Light Emitting Diode

Course Outcomes:

1. Students will be able to analyze and design electrical and electronic circuits practically.
2. Students will be able to study the characteristics of basic electrical circuits.
3. Students will be able to follow electrical safety in all prospects.

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DIPLOMA IN MECHANICAL ENGINEERING (DIPLOMA ME)
Diploma Engineering Semester-II

(Common to all Branches)

Course Code	**DE204**
Course Title	**Engineering Mechanics**
Credits	**3(L: 3 T: 0 P: 0)**

Course Objectives:

Following are the objectives of this course:

1. To obtain resultant of various forces
2. To calculate support reactions through conditions of equilibrium for various structures
3. To understand role of friction in equilibrium problems
4. To know fundamental laws of machines and their applications to various engineering problems

Unit -I

Basics of mechanics and force system: Significance and relevance of Mechanics, Applied mechanics, Statics, Dynamics. Space, time, mass, particle, flexible body and rigid body. Scalar and vector quantity, Units of measurement (SI units) - Fundamental units and derived units. Force – unit, representation as a vector and by Bow's notation, characteristics and effects of a force, Principle of transmissibility of force, Force system and its classification. Resolution of a force - Orthogonal components of a force, moment of a force, Varignon's Theorem. Composition of forces – Resultant, analytical method for determination of resultant for concurrent, non-concurrent and parallel co-planar force systems – Law of triangle, parallelogram and polygon of forces.

Unit– II

Equilibrium: Equilibrium and Equilibrant, Free body and Free body diagram, Analytical and graphical methods of analyzing equilibrium Lami's Theorem – statement and explanation, Application for various engineering problems. Types of beams, supports (simple, hinged, roller and fixed) and loads acting on beam (vertical and inclined point load, uniformly distributed load, couple), Beam reaction for cantilever, simply supported beam with or without overhang – subjected to combination of Point load and uniformly distributed load. Beam reaction graphically for simply supported beam subjected to vertical point loads only.

Unit– III

Friction: Friction and its relevance in engineering, types and laws of friction, limiting equilibrium, limiting

friction, co-efficient of friction, angle of friction, angle of repose, relation between co-efficient of friction and angle of friction. Equilibrium of bodies on level surface subjected to force parallel and inclined to plane.

Equilibrium of bodies on inclined plane subjected to force parallel to the plane only.

Unit– IV

Centroid and center of gravity: Centroid of geometrical plane figures (square, rectangle, triangle, circle, semi-circle, quarter circle) Centroid of composite figures composed of not more than three geometrical figures Centre of Gravity of simple solids (Cube, cuboid, cone, cylinder, sphere, hemisphere) Centre of Gravity of composite solids composed of not more than two simple solids.

Unit – V

Simple lifting machine: Simple lifting machine, load, effort, mechanical advantage, applications and advantages. Velocity ratio, efficiency of machines, law of machine. Ideal

machine, friction in machine, maximum Mechanical advantage and efficiency, reversible and non-reversible machines, conditions for reversibility Velocity ratios of Simple axle and wheel, Differential axle and wheel, Worm and worm wheel,

Single purchase and double purchase crab winch, Simple screw jack, Weston's differential pulley block, geared pulley block.

Reference Books:

1. D.S. Bedi, Engineering Mechanics, Khanna Publications, New Delhi (2008)
2. Khurmi, R.S., Applied Mechanics, S. Chand & Co. New Delhi.
3. Bansal R K, A text book of Engineering Mechanics, Laxmi Publications.
4. Ramamrutham, Engineering Mechanics, S. Chand & Co. New Delhi.

Course outcomes:

After completing this course, student will be able to:

1. Identify the force systems for given conditions by applying the basics of mechanics.
2. Determine unknown force(s) of different engineering systems.
3. Apply the principles of friction in various conditions for useful purposes.
4. Find the centroid and centre of gravity of various components in engineering systems.
5. Select the relevant simple lifting machine(s) for given purposes.

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DIPLOMA IN MECHANICAL ENGINEERING (DIPLOMA ME)
Diploma Engineering Semester-II

(Common to all Branches)

Course Code	**DE205**
Course Title	**Communication Skills-2**
Credits	**3(L: 3T: 0 P: 0)**

Course objectives:

UNIT -1

Formal written skills Office Drafting: Circular, Notice and Memo Job Application with resume. Business correspondence: Enquiry, Order letter, Complaint letter and Adjustment letter.

Report writing: Accident report, fall in production, Progress report, Investigation report.

UNIT -2

Principles of Effective Communication Principles of Effective listening/Speaking Communication Barriers, Overcoming Barrier

UNIT -3

Soft skill development

Speaking skill

Introduction to Group discussion Process of Group Discussion Leadership skill

Instant public speaking

UNIT -4

Etiquettes and Body Language Telephone etiquettes listening/Speaking Problems of telephonic conversation Verbal /oral etiquettes

Physical appearance

Eye contact/ Body Language Group Discussion

Suggested Books:

2. Contemporary English Grammar Structures and Composition; David Green, Macmillan
3. English Grammar and composition; R. C. Jain, Macmillan
4. Effective Technical Communication; M. Ashraf Rizvi, Tata McGraw Hill Companies
5. Developing Communication Skills; Krushna Mohan, Meera Baneji, Macmillan

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DIPLOMA IN MECHANICAL ENGINEERING (DIPLOMA ME)
New Scheme Based on AICTE Flexible Curricula

Semester – III

Branch	Subject Title	Subject Code
ME	Mathematics-III	DE301

Unit -I Integration:

1. Rules of integration (Integrals ofsum, difference, scalar multiplication). Methods of Integration.
2. Integration by substitution Integration of rational functions. Integration by partial fractions.
3. Integration by trigonometric transformation. Integration by parts. Definite Integration. Definition of definite integral. Propertiesofdefiniteintegralwithsimpleproblems. Application of integration
4. Area under the curve. Area between two curves. Mean and RMS values.

Unit – II Differential Equation

Definition of differential equation, order and degree of differential equation. Formation of differential equation for function containing single constant. Solution of differential equations of first order and first degree such as variable separable type, reducible to Variable separable, Homogeneous, Non-homogeneous, Exact, Linear and Bernoulli equations. Applications of Differential equations.

Unit III Laplace Transform

Definition of Laplace transform, Laplace transform of standard functions. Properties ofLaplace transformsuch as Linearity, first shifting, secondshifting, multiplication by tn, division by t.

Unit- IV Fourier Series

Definition of Fourier series (Euler'sformula). Series expansion of continuous functions in the intervals Series expansions of even and odd functions. Half range series.

Unit V Numerical Methods

Solution of algebraic equation Bisection method. Regularfalsi method.

Newton - Raphson method.

Solution of simultaneous equations containing 2 and 3 unknowns Gauss elimination method.

Reference books:

1. Mathematics for polytechnic, S. P. Deshpande , Pune Vidyarthi Griha Prakashan, Pune.
2. Calculus: single variable, Robert T. Smith, Tata McGraw Hill.
3. Higher Engineering Mathematics, B. S Grewal, Khanna Publication, New Delhi

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New Scheme Based on AICTE Flexible Curricula

Semester – III

Branch	Subject Title	Subject Code
ME	**Material Technology**	**DMEP302**

RATIONALE The knowledge of materials, their properties and behavior is essential for people associated with engineering activities. Materials technology plays an important role in design and production of product from the point of view of reliability and performance of product. The curriculum of the subject emphasizes upon understanding the properties and behavior of materials in correlation with their structure and external environmental effects. The range of materials available for engineering use is quite vast, hence only the basic groups of materials such as ferrous, non- ferrous non metallic materials along with their general characteristic and application have been stressed.

1 **Requirement of Engineering materials, mechanical properties and their testing**

Introduction to engineering materials, classification of engineering materials and their properties. Mechanical properties of materials, destructive including Tensile test, compression test, hardness test, impact test fatigue test, endurance limit, bending test, shear test and non- destructive testing methods.

02 Structure of Solid materials: Classification amorphous and crystalline states, unit cells and crystal structure (B.C.C., F.C.C. and H.C.P) allotropy. Crystal imperfection and their effects on properties

4. Solidification of Metal and ingot structure: Process of nucleation and grain growth, ingot solidification, dendritic and columnar structure, segregation of impurities, grain and grain boundaries.

5. Equilibrium Phase Diagrams and Phase Transformation : Equilibrium of phase Diagrams : Plotting of equilibrium diagrams, interpretation, phase rule and lever rule and its application Phase transformations – Eutectic Eutectoid, Peritectic and Peritectoid

5 Practical Metallography: Preparation of specimen, selecting the specimen, mounting the

specimen, grinding , polishing, etching and etching reagents. The metallurgical microscope. Use and care of microscope.

6 Iron-Carbon Equlibrium System : The complete iron carbon diagram and its interpretation. The solidification and cooling of various carbon steels, structures produced, correlation of mechanical properties with carbon content.

7 Heat Treatment of Steels: Objective of heat treatment, thermal processes- annealing, normalizing, hardening and tempering. Hardening process : Surface hardening, flame hardening, case hardening methods, their scope, limitations and advantages, quenching mediums and their effect on hardness, Hardening defects due to improper quenching, hardenability, Jominy end quench test and interpretation of its results. T.T.T. curves interpretation and use, Isothermal heat treatment processes -martempering, austempering, spherodising and patenting

8 Ferrous Metals and Alloys : Classification, types of cast irons their properties and uses, alloy cast-irons, various alloying elements used, their effects on properties and uses. Classification, composition and uses of plain carbon steels, effect of impurities, Alloy steels -various alloying elements, their effects on properties and uses. Alloy steel classification.Tool Steel : Typical compositions, requirements of tool steels, high speed steel, high carbon steel. Standardization of steels. Designation of steals as per B.I.S. codes.

9 Non- Ferrous Metals and Alloys : Copper : Its Properties and uses Cooper Bases Alloys : Brasses, their classification, composition, properties and uses, designation of copper alloys as per B.I.S. aluminum its properties and uses. Aluminum Alloys : Their composition, Classification, properties and uses. Designation of Al- alloys as per B.I.S, Zinc, Nickel and lead their alloys properties and uses Bearing alloys - their composition and field of application.

10 Non- Metallic Materials : introduction to Ceramic Refractory, Rubbers Insulators and Lubricants

11. Plastics: characteristics, classification, commonly used thermosetting and thermoplastic - their properties and uses. Ingredients for processing plastics. Plastic processing methods different methods. 12 Powder Metallurgy:-Introduction and application. Description of process, manufacture and blending of metal powder compacting and sintering.

13 Metal Preservation: Corrosion meaning various mechanism effect of corrosion, methods of

minimizing corrosion

14 Modern Trends in Materials Engineering : New materials like FRP, Composites, synthetic fibers, synthetic wood. Super conductors

REFERENCES

1. Engineering physical Matallurgy-By Prof. Y Lakhtin MIR Publishers mascow
2. A Text Book of Material Science And Metallurgy by O.P. Khanna.
3. Material Science And Process. by S. K. Hazia Choudhry
4. Mechanical Metallurgy by Dieter (Tata Mcgrawhill)
5. Materials For Engineers by M.H.A. Kempsty
6. Introduction to Material Science And Engineeringby K.M. Ralls, T.H. Courtney, John Wuff (Wiley Eastern New Delhi)
7. Physical Matallurgy Principles by Read Hill (Affiliated East- West Press Pvt. Ltd. New Delhi.)
8. Engineering Metalluragy by R. Higgins (ENS).
9. Materials Science by B.S. Narang (Pub. CBS pub. & Distributions New Delhi)

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DIPLOMA IN MECHANICAL ENGINEERING (DIPLOMA ME)
New Scheme Based on AICTE Flexible Curricula

Semester – III

Branch	Subject Title	Subject Code
ME	**Thermal Engineering**	**DMEP303**

Rationale: Mechanical engineers have to work with various power producing & power absorbing devices like boilers, turbines, compressors, pumps etc. In order to understand the principles, construction & working of these devices, it is essential to understand the concept of energy, work, heat & conversion between them. Hence it is important to study the subject of Thermal Engineering which is a core subject. It includes the study of various sources of energy, basic laws & concept of thermo dynamics, gas laws, properties of steam & generation. Heat transfer forms the basis for different power engineering application. Boilers find application in different process industries. Steam turbine sand condensers are the major component of any steam power plant. Mechanical engineer should understand working and application of these devices.

Unit I: Sources of energy

Classification of energy sources - Renewable, Non-Renewable Fossil fuels, CNG, LPG.

Solar - Flat plate and concentrating collectors. - Solar Water Heater - Photo voltaic Cell, Solar Distillation. Wind, Tidal, Geothermal Biogas, Biomass, Bio-diesel Hydraulic, Nuclear Fuel cell–list of fuel cells

Unit II: Ideal Gases

Concept of Ideal gas, Charle's law, Boyle's law, Avogadro's law, equation of state, characteristic gas constant and universal gas constant. Ideal gas processes:- -Isobaric, Isochoric, Isothermal, Adiabatic, Poly tropic, Isentropic with representation of the processes on P-Vand T-S diagram (only simple numerical)

Unit III: Fundamentals of Thermodynamics

Concepts of pure substance, types of systems, properties of systems, Extensive and Intensive properties .Point function and path function. Units of each, PV=MRT, Work and Energy -Thermo dynamic definition of work, heat, difference between heat and work, P.E., K.E, Internal Energy,

Flow work, concepts of enthalpy, entropy. Laws of Thermo dynamic -Zeroth Law, Temperature measurement, principle of energy conservation, irreversibility, Second Law of Thermo dynamics, Kelvin Plank, Claudius statements and their equivalence, Concept of perpetual Motion machine 1 and 2. Application of Thermo dynamic laws -Steady Flow Energy equation and its application open system like boiler, engine, nozzle, turbine, compressor & condenser.

Unit IV: Steam and Steam Boiler

Generation of steam at constant pressure with representation on various charts such as T- H,T-S,HS,P-H. Properties of steam and use of steam table, Quality of Steam and its determination with separating calorimeter (no numerical). Vapour process:- -constant pressure, constant volume, constant an haply, constant entropy (numerical using steam table and Mollier chart), Rankin Cycle

Steam Boilers:- -Classification of boilers. -Construction and working of -Cochran, Babcock and Wilcox, La-mont and Loeffler boiler. Boiler draught– natural, forced and mechanical. Boiler Mountings and Accessories (Introduction only)

Unit V: Steam Turbines and Condensers

Steam nozzle:- -Continuity equation, types of nozzles, concept of Mach number, critical pressure, application of steam nozzles.(simple numerical), Steam turbine:- -Classification of turbines, Construction and working of Impulse and Reaction turbine. Compounding of turbines, Regenerative feed heating, bleeding of steam, nozzle control governing (withvelocity diagrams) (No numerical).

Steam condenser:- Dalton’s law of partial pressure, function and classification of condensers, construction and working of surface condensers. (simple numerical) 5.5 Source so fair leakage, concept of condenser efficiency, vacuum efficiency (no numerical). 5.6 Cooling Towers. -Force draught, natural taught and induced draught

Unit VI: Heat Transfer

Modes of heat transfer:- - Conduction, convection and radiation.

Conduction by heat transfer - Fourier’s law, thermal conductivity, conduction through cylinder, thermal resistance, composite walls, combined conduction and convection (Simple numerical)

Heat transfer by Radiation:- - Thermal Radiation, Absorptive, Transmissivity, Reflectivity, Emissivity, black and gray bodies, Stefan- Bolts man law.

Heat Exchangers:- - Shell and tube, plate type, multiphase heat

References:

1. A Course in Thermal Engineering , R. K. Rajput ,LaxmiPublication, Delhi
2. A Course in Thermal Engineering , P. L. Ballaney ,Khanna Publishers
3. A text book of Thermal Engineering., R. S. Khurmi, S.Chand& co .Ltd.
4. A Course in Thermal Engineering , Domkundwar V. M. ,DhanpatRai &Co.
5. Engineering Thermodynamics, P. K. Nag, Tata Mc GrawHill
6. Steam Table &Mollier Diagram , R. S. Khurmi ,S. Chand & co. Ltd.

RKDF UNIVERSITY RANCHI

DIPLOMA IN MECHANICAL ENGINEERING (DIPLOMA ME)
New Scheme Based on AICTE Flexible Curricula

Semester – III

Branch	Subject Title	Subject Code
ME	**Strength of Material**	**DMEP304**

RATIONALE The technicians from mechanical engineering discipline are expected to know much about this subject so as to fulfill his job functions efficiently. The knowledge is very essential for those who are engaged in design, maintenance, shop- floor inspection, quality control and production departments. The course includes the study of behavior of Engineering materials and stress produced in the structure due to various types of loading systems. The subjects is kept in diploma course so that the students of mechanical engineering discipline should know the proper use of material for common engineering problems.

Unit I: Simple Stress and Strains : Introduction types of loads and deformation, types of stresses and strain. Hooke's law, stress strain diagram for ferrous and non ferrous materials modulus of elasticity. rigidity and bulk modules of materials Stress in bars of varying cross sections, composite sections and compound sections Thermal stresses and strains, thermal stresses in composite sections. Poisson's ratio, volumetric strain, relation between different modulus, strain energy, resilience, proof resilience, modules of resilience suddenly applied loads and impact loads.

Unit II: Mechanical properties and their testing : Mechanical properties of materials, destructive including Tensile test, compression test, hardness test, torsion test, impact test fatigue test, endurance limit, bending test, shear test and non- destructive testing methods.

Unit III: S.F. and B.M. Diagrams : Definition, types of loading types of beams, shear force and bending moment sign conventions S.F. and B.M. diagrams for cantilever simply supported and overhanging beams with point or concentrated loads uniformly distributed loads and combination of point and U.D.L. Point of contra flexure, numerical problems.

Unit IV: Principal Planes and Principal Stresses : Stresses on inclined plane subjected to direct shear or combination of stresses in two mutually perpendicular planes. Principal planes and principal stresses, analytical and graphical method.

Unit V: Bending Stresses in Beams : Theory of simple bending as assumptions made in simple bending theory position of neutral axis, surface moment or resistance. Modules of section of symmetrical sections such as rectangular, circular and I sections, bending stresses in symmetrical sections. Simple problems. Reinforced concrete beams, beam of uniform strength

Unit VI: Shear Stresses in Beams: Introduction shear stress equation, assumptions made, distribution of shear stresses over various sections, such as rectangular, circular and I L & T sections, Simple numerical problems.

Unit VII: Deflection of Beams : Introduction Strength and stiffness of beam curvature of bent beam, Derivation of equation for slope and deflection of beam in case of cantilever and simply supported beam loaded with point loads U.D.L. and combination. Simple numerical problems. Importance of deflection and practical applications.

Unit VIII: Torsion of Shaft : Definition of torsion relation between stress, strain and angle of twist assumptions made strength of solid and hollow circular shaft, polar moment of inertia. Calculation of shaft diameter on the basis of strength and stiffness for the given horse power transmitted torsional rigidity. Maximum torque comparison of solid and hollow shaft size of a shaft for a given torque.

Unit IX: Spring : Definition types and use of springs, leaf spring, helical and spiral springs, Stiffness of a spring and maximum shear stress, defection of spring . Spring Classification based on size shape and load

Unit X: Columns and struts :Definitions crippling load different end conditions, slenderness ratio, equivalent length, Euler's theory Rankine's formulae, radius of gyration, Rankine constant for different materials Limitations of Rankine formula simple problem B.I.S. code for columns.

Unit XI: Stresses in Frames : Definition of frame, perfect, deficient and redundant frame. Assumptions made in finding stress in method of sections and graphical method Bows notation, solution of problems using three methods

Unit XII: Thin Cylinders and Spheres: Hoop stress longitudinal stress on inclined plane subject subjected to direct, shell, volume strain change in value, cylindrical vessels subjected to internal pressure, simple numerical problems.

REFERENCES

1 Strength of Materials. by B.C. Punmia.

2 Strength of Materials. by R.S. Khurmi.

3. Strenght of Materials by Sadhu Singh.

4. Strength of Materials by K.D. Sexena.

5. Strength of Materials by S. Ramamuruthan.

6. Strength of Materials by I.B. Prasad.

7. Strength of Materials by Ryder.

RKDF UNIVERSITY RANCHI

DIPLOMA IN MECHANICAL ENGINEERING (DIPLOMA ME)

Semester – III

Branch	Subject Title	Subject Code
ME	**Basic Mechanical Engineering**	**DMEP305**

Course Learning Objectives:

- To understand General Principles of Mechanical Engineering
- To understand laws of thermodynamics, thermal and thermodynamic Processes
- To understand working principles of Thermal Machines and Power Transmitting Devices
- To understand basic materials and manufacturing processes

Course Content:

UNIT-I: Introduction to Thermodynamics - Role of Thermodynamics in Engineering and Science, Types of Systems, Thermodynamic Equilibrium, Properties, State, Process and Cycle, Elementary introduction to Zeroth, First and Second laws of thermodynamics, Heat and Work Interactions for various non-flow and flow processes; Concept of Heat Engine, Heat Pump & Refrigerator, Efficiency/ COP; Kelvin-Planck and Clausius Statements, Carnot Cycle, Carnot Efficiency, T-S and P-V Diagrams,Concept of Entropy (Definition only).

Unit-II: Heat transfer & Thermal Power Plant: Modes of Heat Transfer; Conduction: Composite Walls and Cylinders, Combined Conduction and Convection: Overall Heat Transfer Co-efficient, Sim- ple Numerical Problems: Thermal Power Plant Layout; Rankine Cycle; Fire Tube and Water Tube boilers, Babcock & Wilcox, Cochran Boilers;

Unit-III: Steam Turbines: Impulse and Reaction Turbines; Condensers: Jet & Surface Condensers, Cooling Towers; **Internal Combustion Engines and Refrigeration:** Otto, Diesel and Dual cycles; P-Vand T-S Diagrams; IC Engines: 2 - Stroke and 4 - Stroke I.C. Engines, S.I. and C.I. Engines.

Unit-IV: Materials and Manufacturing Processes: Engineering Materials, Classification and their Properties; Metal Casting, Moulding, Patterns, Metal Working: Hot Working and Cold Working, Metal Forming: Extrusion, Forging, Rolling, Drawing, Gas Welding, Arc Welding, Soldering, and Brazing.

Unit-V: Machine Tools and Machining Processes: Machine Tools: Lathe Machine and types, Lathe Operations, Milling Machine and types, Milling Operations, Shaper and Planer Machines: Differences, Quick-Return Motion Mechanism, Drilling Machine: Operations, Grinding Machine: Operations

Reference Books:

1. Basic Mechanical Engineering – M.P. Poonia & S.C. Sharma, Khanna Publishing House
2. Elements of Mechanical Engineering – M. L. Mathur, F. S. Mehta and R. P. Tiwari, Jain Brothers, New Delhi
3. Engineering Heat Transfer – Gupta & Prakash, Nem Chand & Brothers, New Delhi
4. Workshop Technology (Vol. 1 and 2) – B. S. Raghuvanshi, Dhanpath Rai and Sons, New Delhi.
5. Basic Mechanical Engineering – J Benjamin
6. Elements of Mechanical Engineering – Roy and Choudhary
7. Engineering Thermodynamics – Spalding and Cole

Course outcomes:

At the end of the course, the student will be able to:

1. Understand basics of thermodynamics and components of a thermal power plant
2. Understand basics of heat transfer, refrigeration and internal combustion engines
3. Understand mechanism of thermal power plant and boiler operation
4. Identify engineering materials, their properties, manufacturing methods encountered in engineering practice
5. Understand functions and operations of machine tools including milling, shaping, grinding and lathe machines

RKDF UNIVERSITY RANCHI

DIPLOMA IN MECHANICAL ENGINEERING (DIPLOMA ME)

Semester – III

Branch	Subject Title	Subject Code
ME	MANUFACTURING PROCESSES	DMEP306

Course Objectives:

1. To teach the process-level dependence of manufacturing systems through tolerances
2. To expose the students to a variety of manufacturing processes including their typical use and capabilities.
3. To teach the important effects that manufacturing processes may have on the material properties of the processed part with a focus on the most common processes
4. . To teach the thermal and mechanical aspects, such as force, stress, strain, and temperature, of the most common processes.
5. To provide a technical understanding of common processes to aid in appropriate process selection for the material and required tolerances
6. To provide a technical understanding of common processes to aid in appropriate material selection for a predetermined process.

Unit I

Welding Technology

Arc Welding: Definition – arc welding equipment – electrode types – filler and flux materials – arc welding methods – metal arc -Metal Inert gas (MIG) – Tungsten inert gas (TIG) – Submerged arc – Electro slag welding – resistance welding – spot welding – butt welding – seam welding – Plasma arc welding – Thermit welding – Electron beam welding – Laser beam welding – friction welding – ultrasonic welding – Induction welding – working principle - applications – advantages and disadvantages.

Gas welding: Oxy-acetylene welding – advantages – limitations -gas welding equipment – Three types of flames – welding techniques – filler rods. – Flame cutting – soldering – brazing - difference between soldering and brazing. Types of welded joints – merits and demerits of welded joints -inspection and testing of welded joints – destructive and nondestructive types of tests – magnetic particle test – radiographic and ultrasonic test – defects in welding – causes and

remedies.

Unit II

Casting : Introduction and history Patterns-Material used, types, Patterns allowances, Cores, Core allowances. Moulding Sand – Types, characteristics and properties of sand. Moulds-Mould materials, Types, Moulding processes, Process and steps in Sand Moulding ,Mould making a. Runner and Gating System b. Core, Chaplets and Chills. c. Parts of Mould ,Melting practice. Types of furnaces with specific application Cupola furnace, Electric arc furnace. , Special casting processes. Viz die-casting, centrifugal casting, Investment casting, Continuous casting ,Casting defects and its remedies

Unit III

Forming Technology

Forging: Hot working, cold working – advantages of hot working and cold working- hot working operations – rolling, forging, smith forging, drop forging, upset forging, press forging – roll forging.

Press Working: Types of presses – mechanical and hydraulic presses – press tools and accessories – press working operations -bending operations – angle bending – channel bending – curling -drawing – shearing operations – blanking, piercing, trimming -notching – lancing.

Powder Metallurgy: Methods of manufacturing metal powders -atomization, reduction and electrolysis deposition – compacting -sintering – sizing – infiltration – mechanical properties of parts made by powder metallurgy – design rules for the power metallurgy process.

UNIT VI

Lathe: Principle, types and specification of Lathes , Functions of basic parts and tools , Operations– grooving, Turning, parting off, Knurling, facing, Boring, Drilling, threading, step turning, taper turning.

UNIT VII

Drilling, Boring & Reaming: Drilling , Introduction, classification of drilling machine & their parts ,Drilling accessories , Nomenclature of twist drill , Cutting parameters ,Reaming, Introduction, Nomenclature of reaming tool , Boring , Introduction, classification of boring machine and their parts , Counter boring and counter sinking operations.

RECOMMENDED BOOKS:

1. Workshop Technology –Part-I & II, Hazra Choudhury, Media Promoters & Publishers Pvt. Ltd.
2. Workshop Technology, Part – I & II by W.A.S. Chapman, ELBS
3. Manufacturing Technology by P.N. Rao, TMH
4. Workshop Technology Vol. I & II by B.S. Raghubanshi
5. Workshop Technology by Raghubansi, Dhanpat Rai & Sons
6. All about Machine Tools by H. Gerling, New Age International (P) Ltd.
7. Manufacturing Engineering and Technology by S. Kalpakijan, Addison-Wesley Publishing Co

Course Outcomes:

Understand the idea for selecting materials for patterns. Types and allowances of patterns used in casting and analyze the components of moulds. Design core, core print and gating system in metal casting processes Understand arc, gas, solid state and resistance welding processes.

Develop process-maps for metal forming processes using plasticity principles. Identify the effect of process variables to manufacture defect free products.

Branch	Subject Title	Subject Code

RKDF UNIVERSITY RANCHI

DIPLOMA IN MECHANICAL ENGINEERING (DIPLOMA ME)

Mechanical Engineering	Fluid Mechanics & Hydraulic Machine	DMEP401

Course Objectives:

This course offers basic knowledge on fluid statics, dynamics and hydraulic machines. The objective of this course is to enable the student to understand laws of fluid mechanics and evaluate pressure, velocity and acceleration fields for various fluid flows and performance parameters for hydraulic machinery.

UNIT-I

Fluid and fluid properties

Concept and classification of fluid.

Properties of fluid

Newton's law viscosity.

Simple numerical examples.

Fluid statics

Laws of fluid statics.

UNIT-II

Types, working and applications of pressure measuring devices (Manometers and mechanical gauges) with simple numerical examples.

Selection criteria for pressure measuring devices.

UNIT-III

Fluid kinematics

Concept of control volume.

Fluid flow

i. Continuity and energy equation.
ii. Momentum equations (without derivation) and its application in impact of jet.
iii. Types of fluid flow.
iv. Flow patterns for ideal, laminar, turbulent and compressible fluid flow of one dimension.

Simple numerical problems on all of above

UNIT-IV

Fluid dynamics and flow measurement

Fluid energy-types and interrelations.

Euler's equation. i. Concept and definition. ii. Understanding various terms in Euler's equation (No derivation).

Bernoulli's equation. i. Concept and definition. ii. Limitations and assumptions. iii. Derivation from Euler'sequation. iv. Applications.

Flow measurement. i. Parameters and units of measurements related to following devices. ii. Devices- classifications, principle, working, applications without derivation. (Pitot tube, Venturi meter, Flow nozzle, Rota meter, Orifice, Notch).

Selection criteria for flow measuring device. 4.6 Simple numerical examples on all of above.

UNIT-V

Flow through pipes

Introduction to pipe and pipe flow.

Reynolds's experiment, friction factor, Darcy's equation, Moody's chart.

Water hammer effect.

Selection criteria for pipes and pipe sizes.

Simple numerical examples.

UNIT-VI

Hydraulic Turbines

Layout and classification of hydro electric power plant.

Selection of turbine on the basis of head and discharge available

Construction and working principle of Pelt on wheel, Francis and Kaplan turbine.

Calculation of Work done, Power, efficiency of turbine.

Draft tubes– types and construction, Concept of cavitations in turbines Hydraulic pumps & prime movers

UNIT-VII

Pumps:

Concept and classification of pumps.

Detailed study (construction, working and applications) of i. Centrifugal pump. ii. Reciprocating pump. iii. Submersible pump. iv. Rotary positive displacement type pumps like Gear pump and Van pump. v. Vacuum pump.

Performance (efficiency, discharge, head, specific speed and power consumption) of centrifugal pump and reciprocating pump with simple numerical example.

Characteristic curves of centrifugal pump and reciprocating pump.

Need for priming of centrifugal pump.

Selection of pumps. Hydraulic prime movers (Turbine).

Classification, construction, working principle and applications of: i. Pelton wheel. ii. Francis turbine. iii. Kaplan turbine.

Selection criteria of prime movers.

RECOMMENDED BOOKS:

1. Hydraulics & Hydraulic Machines by Modi & Seth, Standard Book
2. Hydraulics & Hydraulic Machines by R.K. Bansal
3. Fluid Mechanics by A.K. Jain, Khanna Publishers
4. Hydraulic and Fluid Mechanics by Jagadish Lal, Metropolitan Book
5. Hydraulics, Fluid Mechanics and Fluid Machines by R.S. Khurmi
6. Fluid Mechanics & Hydraulics Machines by R K Rajput
7. Fluid Mechanics & Hydraulics Machines by Domkundwar

Course Outcomes:

The student will be able to:

• Identify importance of various fluid properties at rest and in transit.

• Derive and apply general governing equations for various fluid flows

• Understand the concept of boundary layer theory and flow separation.

• Plot velocity and pressure profiles for any given fluid flow.

• Evaluate the perfomance characteristics of hydraulic turbines and pumps.

RKDF UNIVERSITY RANCHI

DIPLOMA IN MECHANICAL ENGINEERING (DIPLOMA ME)

Branch	Subject Title	Subject Code
Mechanical Engineering	**Theory of Machine**	**DMEP402**

COURSE OBJECTIVES:

This course provides

1. To identify and enumerate different link based mechanisms with basic understanding of motion
2. To interpret and analyse various velocity and acceleration diagrams for various mechanisms
3. To understand and illustrate various power transmission mechanisms using suitable method
4. To design and evaluate the performance of different cams and followers.

Unit – I

Introduction

Theory of machines: introduction, need, scope and importance in design and analysis.

Kinematics, kinetics and dynamics concept and examples.

Basic terminology related to machines and mechanisms.

Development of different mechanisms and its inversions like four bar chain mechanism , slider crank mechanism, double slider crank mechanism, etc

Unit – II

Velocity and acceleration diagram

Basic concept used in solving velocity and acceleration problems.

Approach to solve velocity and acceleration related to mechanisms using Relative velocity method for single slider crank mechanism and Four bar chain mechanism.

Klein's construction for single slider cranks mechanism.

Unit – III

Friction

Concept and laws of friction.

Appreciate the role of friction in thrust bearing, pivot bearing and collars considering - Uniform pressure and Uniform wear condition

Clutch: i. Functions. ii. Types with sketches and working.

Brakes: i. Functions. ii. Types with sketches and working.

Dynamometers- types and operational working principles.

Unit – IV

Power transmission

Introduction, need and modes of power transmission.

Types of power transmission. 5b.Solve problems on flat belt drive.

Belt drive- types, terminology and standards/designation methods as per BIS/ISO.

Belt speed-co-efficient of friction, velocity ratios and slip.

Power transmitted by flat belt - tensions, centrifugal tensions, maximum tension, condition for transmitting maximum power and initial tension.(with derivations), numerical examples.

Merits and demerits of power transmission drives

Unit – V

Flywheel and governor

Turning moment diagram: i. Concept. ii. Its use for different machines. iii. Fluctuations of energy.

Co-efficient of fluctuation of speed and energy.

Method to construct turning moment diagram, numerical examples.

Flywheel: functions and types.

Moment of inertia and mass calculation of flywheel-numerical examples.

Governors: terminology, types & functions.

Unit – VI

Balancing and vibrations

Concepts and types of balancing.

Effects of unbalanced masses.

Balancing of revolving masses in same plane: i. Analytical and graphical methods to find balancing mass. ii. Numeric examples.

Balancing of reciprocating masses

Vibration: i. Terminology. ii. Effects. iii. Causes. iv. Remedies.

RECOMMENDED BOOKS:

1. The Theory of Machines by Thomas Bevan, CBS Publishers & Distributors
2. Theory of Machine by Saha, Jadavani
3. Theory of Machine by P. L. Ballaney
4. Theory of Machine by R.S. Khurmi
5. Theory of Machine by Abdullah Shariff, DhanpatRai& Sons
6. Theory of Machines by SS Ratan
7. Theory of Machine by J E Shigl

COURSE OUTCOMES:

The student shall be able to

1. To identify and enumerate different link based mechanisms with basic understanding of motion
2. To understand and illustrate various power transmission mechanisms using suitable methods
3. To understand and illustrate various power transmission mechanisms using suitable methods

To design and evaluate the performance of different cams and followers

RKDF UNIVERSITY RANCHI

DIPLOMA IN MECHANICAL ENGINEERING (DIPLOMA ME)

Branch	Subject Title	Subject Code
Mechanical Engineering	**Mechanical Drafting & Auto-CAD**	**DMEP403**

Objectives

1. To introduce Autodesk's AutoCAD software as a design and drafting tool.
2. To introduce basic 2D CAD commands, command interface, workspace, viewports and printing concepts.
3. To cover creation, retrieval and modification of 2D drawing files that meet industry standards with an emphasis on mechanical design for the manufacturing industry.

Requirement: Completion of CAS 100A or proficiency in computer operations using Microsoft Windows. Audit available.

UNIT I

Fundamentals of CAD

Computer graphics & its terminology.

1.2 CAD definition, concept & need.

1.3 CAD process.

1.4 Functional areas of CAD.

1.5 Coordinate systems.

1.6 Geometric transformation-concept and types.

1.7 2 dimensional (2D) geometric transformation- translation, scaling, rotation and mirror with numeric examples.

UNIT II

Geometric modeling

Difference between 2D & 3D models.

Geometric modeling – concept, types, features and applications.

Solid modeling methods like Constructive Solid Geometry, Pure primitives & Boundary Representation

Feature base modeling-concept, illustrative examples.

Parametric & non parametric modeling-concept, differences and illustration.

UNIT III

3D Modeling using AutoCAD

Introduction to AutoCAD-3D features and 2D commands overview.

3D primitives-types and defining parameters.

User coordinate system (UCS) and its options.

3D draw commands.

3D modify and editing commands.

3D viewing & views generation.

Surface modeling commands.

UNIT IV

3D parametric modeling

Introduction to parametric modeling software. (Any one from Creo, Unigraphics, CATIA, Solid Edge, Inventor etc).

Sketching interfacing overview.

3D working plane introductions.

3D modeling.

Assembly modeling.

Views generation

Text/reference books:

1. Creo 2.0 for designer and engineers- Sham Tickoo-Dreamtech press
2. Designing with Creo Parametric 2.0 -Dr. Michel J Rider- SDC Publications
3. Pro/Engineer wildfire 5.0 instructor David- S. Kelley -McGraw-hill
4. Unigraphics for designer & engineers -Sham Tickoo-Dreamtech press
5. AutoCAD for engineers and Designers -Sham Tickoo-Dreamtech press
6. Machine design -K.C.Jhon- PHI
7. Production drawing -K.L.Narayan- New age publication
8. Fundamental of Geometric dimensioning &tolerancing-Alex kruleski-Cengage publication

9. CAD/CAM & Automation -Farzakhaidaree-Nirali

10. Machine drawing including AutoCAD-Ajeetsingh-McGraw-hill

Outcomes

Upon completion of the course students will be able to:

- Utilize the power and precision of AutoCAD as a drafting and design tool used in the mechanical design and manufacturing industries.
- Apply basic CAD concepts to develop and construct accurate 2D geometry through creation of basic geometric constructions.
- Create, manipulate and edit 2D drawings and figures.
- Apply elements of mechanical drafting such as layers, dimensions, drawing formats, and 2D figures in projects with a focus on ANSI industry standards.

RKDF UNIVERSITY RANCHI

DIPLOMA IN MECHANICAL ENGINEERING (DIPLOMA ME)

Branch	Subject Title	Subject Code
Mechanical Engineering	Metrology & Quality Control	**DMEP404**

Course Objectives

The main objective of this course is to make students familiar with the mechanical measuring systems, and the standard measurement methods. It further aims to make them to understand the basic measurement systems in the real time engineering applications.

1.Introduction to metrology

Metrology Basics Definition of metrology, Categories of metrology, Scientific metrology, Industrial metrology, Legal metrology, Need of inspection, Revision of (no questions be set) -Precision, Accuracy, Sensitivity, Readability, Calibration, Traceability, Reproducibility, Sources of errors, Factors affecting accuracy, Selection of instrument, Precautions while using an instrument for getting higher precision and accuracy.

Limits, Fits, Tolerances and Gauges Concept of Limits, Fits, And Tolerances, Selective Assembly, Interchangeability, Hole And Shaft Basis System, Taylor's Principle, Design of Plug, Ring Gauges, IS919- 1993 (Limits, Fits & Tolerances, Gauges IS 3477-1973, concept of multi gauging and inspection.

Linear Measurement Description, working principle, method of reading, least count for Vernier calipers, Micrometers (Outside micrometers, Inside Micrometers), Depth gauge, Height Gauge, Feeler Gauge, Slip gauges (category, use, Selection of Slip Gauges for setting particular dimension), Length bars, Angular Measurement Concept, Instruments For Angular, Measurements, Working And Use of Universal Bevel Protractor, Sine Bar, Spirit Level, Principle of Working of Clinometers, Angle Gauges (With Numerical on Setting of Angle Gauges).

Standards and Comparators Definition and introduction to line standard, end standard, Wavelength standard, Definition, Requirement of good comparator, Classification, use of comparators, Working principle of comparators, Dial indicator, Sigma comparator, Pneumatic comparator, Electrical, Electronic, Relative advantages and disadvantages.

2.Threads and Gear Metrology

Screw thread Measurements Types of thread, Errors in threads, Pitch errors, Measurement of different elements such as major diameter, minor diameter, effective diameter, pitch, two wire methods, Thread gauge micrometer, Working principle of floating carriage dial micrometer.

Gear Measurement and Testing Analytical and functional inspection, rolling test, Measurement of tooth thickness, gear tooth vernier, Errors in gears such as backlash, run out, composite.

3.Testing Techniques

Measurement of surface finish Primary and secondary texture, Sampling length ,Lay, terminology as per IS 3073- 1967, direction of lay, Sources of lay and its significance, CLA, Ra, RMS, Rz values and their interpretation, Symbol fordesignating surfacefinish on drawing, Various techniques of qualitative analysis, Machine tool testing Parallelism, Straightness, Squareness, Coaxiallity, roundness, run out, alignment testing of machine tools as per IS standard procedure.

4.Quality Control

Quality : Definitions, meaning of quality of product & services, Quality characteristics, Quality of design, Quality of conformance, Quality of performance, Concept of reliability, Cost, Quantity assurance, Cost of rework & repair, Quality & Inspection, Inspection stages.

Total Quality Management: Principles and concept of total quantity management.

Quality Audit: Concept of audit practices, lead assessor certification.

Six sigma: Statistical meaning, methodology of system improvement,

ISO 9000 Series & other standards Concept, ISO 9000 series quality standards, QS14000, Standards in general, Its evaluation & Implications, necessity of ISO certification, other Quality systems.

5.Elementary Statistics & it's application in quality control

Statistical Quality Control– Meaning and importance of SQC, Variable and attribute Measurement. control charts – inherent and assignable sources of variation, control charts for variables – X& R charts, control charts for attributes p, 100p np, C, U- charts (simple numerical based on charts), process capability of machine, determination of statistical limits, different possibilities, Rejection area, Statistically capable and incapable processes, Acceptance Sampling– Concept, Comparison with 100% inspection, Different types of sampling plans, with merits and demerits.

Reference Books

1. Engineering Metrology, R.K.Jain, Khanna Publisher
2. Metrology for engineers, J.F.W. Galyer & C. R. Shotbolt , ELBS
3. Engineering Metrology, K.J. Hume, Kalyani Publishers
4. A textbook of Engineering metrology, I.C.Gupta, Dhanpat Rai and Sons
5. Metrology Labmanual, T.T.T.I., M. Adithan & R.Bahn
6. Statistical Quality Control, M. Mahajan, Dhanpat Rai & Sons Chennai
7. Quality Control, T.T.T.I, Tata McGraw Hill

Course outcomes:

They can understand the standards of length, angles, they can understand the evaluation of surface finish and measure the parts with various comparators. The quality of the machine tool with alignment test can also be evaluated by them.

RKDF UNIVERSITY RANCHI

DIPLOMA IN MECHANICAL ENGINEERING (DIPLOMA ME)

Branch	Subject Title	Subject Code
ME	Heat Transfer	DMEP405(E)

Course Objectives

1) Understand the fundamentals of heat transfer processes occurring in natural and engineered systems and convey that understanding in course homework and exams.

2) Apply analytic procedures, numerical tools and problem-solving abilities to heat transfer problems such as those assigned in course homework and exams.

3) Understand and perform experimental measurement techniques for heat transfer measurements as illustrated by written laboratory reports describing methods and results.

Module-I

Introduction to Heat Transfer: Concepts of the mechanisms of heat flows; Conduction, convection and radiation; Effect of temperature on thermal conductivity of materials; Introduction to combined heat transfer mechanism. 2 Conduction: One-dimensional general differential heat conduction equation in the rectangular, cylindrical and spherical coordinate systems; Initial and boundary conditions. Steady State one-dimensional Heat conduction : Composite Systems in rectangular, cylindrical and spherical coordinates with and without energy generation; Thermal resistance concept; Analogy between heat and electricity flow; Thermal contact resistance; Critical thickness of insulation.

Module-II

Fins: Heat transfer from extended surfaces, Fins of uniform cross-sectional area Errors of measurement of temperature in thermometer wells. Transient Conduction: Transient heat conduction; Lumped capacitance method; Time constant; Unsteady state heat conduction in one dimension only, Heisler charts

Module-III

Forced Convection: Basic concepts; Hydrodynamic boundary layer; Thermal boundary layer; Approximate integral boundary layer analysis; Analogy between momentum and heat transfer in turbulent flow over a flat surface; Mixed boundary layer; Flow over a flat plate; Flow across a

single cylinder and a sphere; Flow inside ducts; Empirical heat transfer relations; Relation between fluid friction and heat transfer; Liquid metal heat transfer. Natural Convection : Physical mechanism of natural convection; Buoyant force; Empirical heat transfer relations for natural convection over vertical planes and cylinders, horizontal plates and cylinders, and sphere ; Combined free and forced convection.

Module-IV

Thermal Radiation : Basic radiation concepts; Radiation properties of surfaces; Black body radiation Planck's law, Wein's displacement law, Stefan Boltzmann law, Kirchoff's law; ; Gray body; Shape factor; Black-body radiation; Radiation exchange between diffuse non black bodies in an enclosure; Radiation shields; Radiation combined with conduction and convection; Absorption and emission in gaseous medium; Solar radiation; Green house effect.

Module-V

Heat Exchanger : Types of heat exchangers; Fouling factors; Overall heat transfer coefficient; Logarithmic mean temperature difference (LMTD) method; Effectiveness-NTU method; Compact heat exchangers. Condensation And Boiling : Introduction to condensation phenomena; Heat transfer relations for laminar film condensation on vertical surfaces and on outside & inside of a horizontal tube; Effect of non-condensable gases; Dropwise condensation; Heat pipes; Boiling modes, pool boiling; Hysteresis in boiling curve; Forced convective boiling. Introduction To Mass Transfer: Introduction; Fick's law of diffusion; Steady state equimolar counter diffusion; Steady state diffusion though a stagnant gas film.

Learning Outcomes

1) Able to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.

2) Able to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions;

3) Able to acquire and apply new knowledge as needed, using appropriate learning strategies.

Books:

1. Elements of Heat transfer by Bayazitouglu & Ozisik, McGraw-Hill Book Company.
2. Heat Transfer By J.P. Holman, McGraw-Hill International edition.
3. Schaum's outline of Heat Transfer by Pitts & Sisson McGraw-Hill International edition.
4. Principles of Heat Transfer by Frank Kreith, McGraw-Hill Book co.
5. Fundamentals of Momentum, Heat and Mass Transfer by James R.Welty; John Wiley & Sons (Pvt). Ltd.
6. Heat Transfer, by Vijay Gupta, New Age International (P) Ltd. Publishers
7. Heat Transfer, by Y.V.C. Rao, University Press.
8. Heat Transfer, by R. Yadav, Central Publishing House, Allahabad

RKDF UNIVERSITY RANCHI

DIPLOMA IN MECHANICAL ENGINEERING (DIPLOMA ME)

Branch	Subject Title	Subject Code
ME	Automobile Engineering	DMEP406(E)

Course Objectives:

To understand & apply the knowledge about various system, subsystems & their interrelationships of the automobile for the manufacturing of advanced automotive techniques

Course Outcomes:

A. Know the different types of automobiles, basic structure of automobile and their manufacturers in India. Understand the basic engine system working R/U/A 2 10

B. Understand the transmission of power in automobile R/U/A 2 10

C. Familiarize with fuel supply to automobile and understand the cooling system R/U/A 2 08

D. Explain the steering and braking system employed in automobiles R/U/A 2 08

E. Explain the different suspension system of an automobile and selection of tyre for an automobile R/U/A 2 10

F. Explain the Electrical and ignition system employed in Automobile

Module-I

VEHICLE STRUCTURE AND ENGINES Types of automobiles, vehicle construction and different layouts, chassis, frame and body, resistances to vehicle motion and need for a gearbox, components of engine-their forms, functions and materials

Module-II

ENGINE AUXILIARY SYSTEMS Electronically controlled gasoline injection system for SI engines, electronically controlled diesel injection system (Unit injector system, Rotary distributor type and common rail direct injection system), Electronic ignition system, Turbo chargers, Engine emission control by three way catalytic converter system.

Module-III

TRANSMISSION SYSYTEMS Clutch-types and construction, gear boxes- manual and automatic, gear shift mechanisms, Over drive, transfer box, fluid flywheel –torque converter, propeller shaft,

slip joints, universal joints, Differential, and rear axle, Hotchkiss Drive and Torque Tube Drive.

Module-IV

STEERING, BRAKES AND SUSPENSION SYSTEMS: Steering geometry and types of steering gear Box- Power Steering, Types of Front Axle, Types ofSuspension Systems, Pneumatic and Hydraulic Braking Systems, Antilock Braking System and Traction Control

Module-V

ELECTRICAL AND CONTROL SYSTEMS : Storage battery, construction and operation of lead acid battery, testing of battery, principle of operation of starting mechanism, different drive systems, starter relay switch, regulator electric fuel gauge, fuel pump, horn, wiper, Lighting system, head light dazzling, signaling devices, battery operated vehicles, choppers. importance of maintenance, scheduled and unscheduled maintenance, wheel alignment, trouble Shooting probable causes & remedies of various systems, microprocessor based control system for automobile, intelligent automobile control systems.

Text /Reference Books:

1. A.K. Babu, S.C. Sharma, Automobile Mechanics, Khanna Book Publishing, 2019.
2. A.K. Babu, S.C. Sharma, Automobile Engines, Khanna Book Publishing, 2019.
3. Kirpal Singh, Automobile Engineering, 7th ed., Standard Publishers, New Delhi, 1997.
4. Jain K.K. and Asthana R.B., Automobile Engineering, Tata McGraw Hill, New Delhi, 2002.
5. Heitner J., Automotive Mechanics, 2nd ed., East-West Press, 1999.
6. Heisler H., Advanced Engine Technology, SAE International Publ., USA, 1998.

Online Resources:

1. https://archive.nptel.ac.in/courses/107/106/107106088/

RKDF UNIVERSITY RANCHI

DIPLOMA IN MECHANICAL ENGINEERING (DIPLOMA ME)

Branch	Subject Title	Subject Code
ME	Alt. Sources of Energy	DMEP407(E)

UNIT I: ENERGY CONSERVATION & STORAGE

Energy- Energy Sources & their Availability - Importance of Renewable Energy Resources - Principles of energy conservation- Energy storage- Necessity of energy storage-Energy storage methods-Mechanical Energy storage-Pumped storage-Compressed air storage Electrical Storage -Lead Acid Battery -Chemical Storage -Energy storage via hydrogen - Electromagnetic energy storage.

UNIT II: SOLAR ENERGY

Solar energy - Introduction-Solar constant- Solar Radiation at the Earth's surface, measurements of solar radiation- pyronometer- pyrheliometer-sunshine recorder– Solar collectors-Classification- liquid flat plate collector-construction- effect of various parameter on its performance- Concentrating collector- Focusing and non- focusing type-Applications of Solar Energy- solar water heater- Solar Cooker- Box type- Solar dryer- solar green house—Summer and winter greenhouse- solar electric power generation- Solar photovoltaic.

UNIT III: WIND ENERGY

Introduction- Basic Principles of Wind energy conversion-The nature of wind- The power in the wind (No derivations)- Forces on the Blades (No derivations)-Site Selection considerations- Basic components of a wind energy conversion system (WECS)-Advantages & Limitations of WECS-Wind turbines (Windmill)- Horizontal Axis windmill- Vertical Axis windmill- performance of windmills- Environmental aspects.

UNIT IV: BIOMASS ENERGY

Introduction- Biomass conversion techniques- Biogas Generation- Factors affecting biogas Generation-Types of biogas plants- Advantages and disadvantages of biogas plants- urban waste to energy conversion- MS Wincineration plant.

UNIT V: GEOTHERMAL & TIDAL ENERGY.

Geothermal Sources- Hydro thermal Sources- a. Vapor dominated systems b. Liquid dominated systems- Prime movers for geothermal energy conversion-Tidal Energy- Basic Principles of Tidal Power-Components of Tidal Power Plants- Schematic Layout of Tidal Power house-Advantages & Limitations of Tidal power.

UNIT VI: DIRECT ENERGY CONVERSION SYSTEM

Thermo-Electric power- Basic Principles-Thermoelectric power generator-Thermionic Generation – Introduction-Thermionic emission & work function- Basic Thermionic generator-Chemical Energy Sources-Introduction-Fuel cells–Principles of operation, classification & Types- Applications of fuel cells.

Reference Books:

1. Non-Conventional energy sources, G.D. Rai, Khanna Publishers
2. Solarenergy, H.P. Garg, Mc Graw Hill, Education
3. Renewable Energy Sources & Emerging Technologies., D P Kothari, K C Singal & Rakesh Ranjan, Prentice Hall India
4. Energy opportunities and social responsibility, Satyesh C. Chakraborty, Jaico publications

RKDF UNIVERSITY RANCHI

DIPLOMA IN MECHANICAL ENGINEERING (DIPLOMA ME)

Branch	Subject Title	Subject Code
Mechanical Engineering	CAD/CAM	DMEP408(E)

UNIT-1

Introduction to CAD/CAM: Role and Need of Computers in industrial manufacturing. Product Cycle, CAD/CAM. CAD/CAM hardware:-Basic structure, CPU, Memory, I/O Devices, Storage devices and system configuration.

UNIT-2

Geometric Modeling: Requirement of geometric modeling, Types of geometric models.

Geometric construction methods:- sweep, solid modeling- Primitives & Boolean operations, free formed surfaces (Classification of surface only),

Rapid Prototyping (No numerical treatment)

UNIT-3

Introduction to computer numerical Control: Introduction NC, CNC, DNC, Advantages of CNC,T he coordinate system in CNC, Motion control system-point to point, straight line, Continuous path(Contouring).Absolute system and Incremental system, Feedback control system, Application of CNC.

UNIT-4

Part programming: Fundamentals, manual part programming, NC–Words, Programming format, part programming, use of sub routines and do loops, computer aided part programming(APT).

Reference Books:

1. CAD/CAM Principles and Applications, P.N. Rao, Tata McGraw-Hill
2. Computer Aided design and manufacturing, Groover M.P. & Zimmers Jr, Prentice hall of India

RKDF UNIVERSITY RANCHI

DIPLOMA IN MECHANICAL ENGINEERING (DIPLOMA ME)

Branch	Subject Title	Subject Code
Mechanical Engineering	COMPUTER INTEGRATED MANUFACTURING	DMEP409(E)

Course Objectives:

- To understand General Principles of Mechanical Engineering.
- To understand laws of thermodynamics, thermal and thermodynamic Processes
- To understand working principles of power developing and power absorbing devices
- To understand basic materials and manufacturing processes

Course Content:

UNIT-I: Concept of Computer Integrated Manufacturing (CIM); Basic components of CIM; Distributed database system; distributed communication system, computer networks for manufacturing; future automated factory; social and economic factors.

Unit-II: Computer Aided Design (CAD): CAD hardware and software; product modeling, automatic drafting; engineering analysis; FEM design review and evaluation; Group Technology Centre.

Unit-III: Computer Aided Manufacturing (CAM), Computer assisted NC part programming; Computer assisted robot programming; computer aided process planning (CAPP); computer aided material requirements planning (MRP)

Unit-IV: Computer aided production scheduling; computer aided inspection planning; computer aided inventory planning, Flexible manufacturing system (FMS); concept of flexible manufacturing.

Unit-V: Integrating NC machines, robots, AGVs, and other NC equipment; Computer aided quality control; business functions, computer aided forecasting; office automation

Reference Books:

1. CAD, CAM, CIM - P.Radhakrishnan and S.Subramanyan, New Age International Publishers.
2. Computer Integrated Manufacturing - Paul G. Rankey, Prentice Hall.
3. Robotics Technology and Flexible Automation – S.R. Deb, Tata McGraw Hill.

Course outcomes:

At the end of the course, the student will be able to:

6. Understand the formulation of Liner Programming
7. Analyze and Convert the problem into a mathematical model.
8. Understand the dual LP and Primal Dual relation problems
9. Understand and implement the transportation problems at workplace
10. Solve the assignment problems, solving linear programming approach using software

RKDF UNIVERSITY RANCHI

DIPLOMA IN MECHANICAL ENGINEERING (DIPLOMA ME)

Branch	Subject Title	Subject Code
Mechanical Engineering	**Tool Engineering**	DMEP410(E)

Course Learning Objectives:

- To understand the concepts of cutting tools and cutting forces involved in metal cutting process.
- To understand tool angles of various cutting tools & their importance.
- To understand and evaluate the tool wear and tool life with the help of Taylors tool life equation.
- To understand the types of press, forming dies and their constructions.
- To understand the designing of strip layout for given component.

Course Content:

UNIT-I: Jigs and fixtures: – Necessity for jigs and fixtures - Elements of fixtures, design considerations, locators, types of locators, clamping and guiding devices, swarf disposal methods

UNIT-II: Work holding devices for flat, round and irregular surface: Design of drill jigs, bush specifications. Fixture for lathe operations, milling, broaching and welding fixtures, fixtures for CNC machines, modular fixtures.

UNIT-III: Press working: tools, blanking and piercing tools, load variation during blanking, Calculation of press tonnage for blanking and piercing. Types of dies, simple, compound, combination and progressive dies- Design of compound and progressive dies. Bending and drawing dies: Bending allowances, bending methods. Bending pressure-calculation of blank size and press tonnage for drawing, metal flow during drawing operations - Fine blanking, Embossing and Coining.

UNIT-IV: Tool for forging, Design of drop forging dies: - Rolling, strip rolling theory, stress distribution in rolling, Roll separation force and torque. Forces acting on single point and multiple point cutting tools

UNIT-V: CAD for tooling: Turret press FMS-Computer applications (CAD / CAM) in short metal press work – Quick die change method – Single minute exchange of dies- group tooling –Design of single point tools – Plastic as a tooling materials – Fluidized bed fixturing.

Reference Books:

1. Tool Design – Cysil Donaldson TMH
2. Tool Design – Cole G.B.
3. Die Design Hand Book – ASTME
4. Jigs and Fixtures – Calving-Hoose
5. Jig and Fixture Design Hand Book – William and Boyes
6. Fundamentals of tool design – ASTME & Edward G. Hoffman
7. Fundamentals of Fixture Design – V. Koraskove Mir.
8. Metal Hand Book- ASM

Course outcomes:

At the end of the course, the student will be able to:

8. Select cutting tools and its material using data book and manufacturer's catalogue.
9. Estimate tool wear and tool life.
10. Use press tools and dies effectively.
11. Design strip layout for given component.
12. Decide appropriate cutting fluid for machining process improvement.

RKDF UNIVERSITY RANCHI

DIPLOMA IN MECHANICAL ENGINEERING (DIPLOMA ME)

Branch	Subject Title	Subject Code
Mechanical Engineering	**Ad. Thermal Engineering**	**DMEP501**

OBJECTIVES

1. Analyze, design and evaluate thermal systems using state of the art engineering tools and techniques
2. Develop methods of energy conservation for sustainable growth
3. Communicate effectively and support constructively towards team work
4. Pursue lifelong learning for professional growth with ethical concern for society and environment

UNIT I

Combustion Thermodynamics:

Theoretical (Stoichiometric) air for combustion of fuels. Excess air, mass balance, Exhaust gas analysis, A/F ratio. Enthalpy of formation, enthalpy and internal energy of combustion. Combustion efficiency. Dissociation and equilibrium, emissions.

UNIT II

Vapour Power Cycles:

Carnot vapour power cycle, drawbacks as a reference cycle. Simple Rankine cycle; description, T-s diagram, analysis for performance. Comparison of Carnot and Rankine cycles. Actual vapourpower cycles. Ideal and practical regenerative Rankine cycles, open and closed feed water heaters. Reheat Rankine cycle.

UNIT-III

Refrigeration Cycles:

Vapour compression refrigeration system; description, analysis, refrigerating effect. Capacity, power required units of refrigeration, COP, Refrigerants and their desirable properties, alternate Refrigerants. Air cycle refrigeration; reversed Carnot cycle, reversed Brayton cycle, Vapour absorption refrigeration system.

UNIT-IV

Psychrometrics and Air-conditioning Systems:

Properties of Atmospheric air, and Psychometric properties of Air, Psychometric Chart, Analyzing Air-conditioning Processes; Heating, Cooling, Dehumidification and Humidification, Evaporative Cooling. Adiabatic mixing of two moist air streams. Cooling towers.

UNIT V

Reciprocating Compressors & Steam nozzles:

Reciprocating Compressors: Operation of a single stage reciprocating compressors. Work input through p-v diagram and steady state steady flow analysis. Adiabatic, Isothermal and Mechanical efficiencies. Multistage compressor, saving in work, Optimum intermediate pressure, Inter-cooling, **Steam nozzles:** Flow of steam through nozzles, Shape of nozzles, effect of friction, Critical pressure ratio, Supersaturated flow.

TEXT BOOKS:

1. Thermodynamics an engineering approach, by Yunus A. Cenegal and Michael A. Boles. Tata McGraw hill Pub. Sixthedition, 2008.
2. Basic and Applied Thermodynamics" by P .K. Nag, Tata McGraw Hill, 2nd Edi. 2009
3. Fundamentals of Thermodynamics by G.J. Van Wylen and R.E. Sonntag, Wiley Eastern. Fourth edition 19993.

REFERENCE BOOKS:

1. Thermodynamics for engineers, Kenneth A. Kroos and Merle C. Potter, Cengage Learning,2016
2. Principles of Engineering Thermodynamics, Michael J,Moran, Howard N. Shapiro, Wiley, 8th Edition
3. An Introduction to Thermo Dynamics by Y.V.C.Rao, Wiley Eastern Ltd, 2003.
4. Thermodynamics by Radhakrishnan. PHI, 2nd revised edition.

OUTCOMES:

1. An ability to independently carry out research/investigation and development work to solve practical problems

2. An ability to write and present a substantial technical report/document

3. Demonstrate a degree of mastery over thermal engineering at a level higher than the Bachelor's program.

4. Design, develop and analyze thermal systems for improved performance

5. Identify viable energy sources and develop effective technologies to harness them

6. Engage in lifelong learning adhering to professional, ethical, legal, safety, environmental and societal aspects for career excellence

RKDF UNIVERSITY RANCHI

DIPLOMA IN MECHANICAL ENGINEERING (DIPLOMA ME)

Branch	Subject Title	Subject Code
Mechanical Engineering	**Design of Machine Elements**	DMEP502

Course Objectives:

- To enable the student to design and draw simple machine components used in small and medium scale industries.
- To understand the basic philosophy and fundamentals of Machine Design.
- To understand the modes of failures of m/c components and decide the design criteria and equations.
- To analyze and evaluate the loads, forces, stresses involved in components and subassem- blies and decide the dimensions.
- To develop analytical abilities to give solutions to engineering design problems.

Course Content:

UNIT-I: Introduction to Design: Machine Design philosophy and Procedures; General Considerations in Machine Design; Fundamentals: Types of loads, concepts of stress, Strain, Stress – Strain Diagram for Ductile and Brittle Materials, Types of Stresses; Bearing pressure Intensity; Crushing; Bending and Torsion; Principal Stresses; Simple Numericals; Creep strain and Creep Curve; Fatigue; S-N curve; Endurance Limit; Factor of Safety and Factors governing selection of factor of Safety; Stress Concentration: Causes & Remedies; Converting actual load or torque into design load or torque using design factors like velocity factor, factor of safety & service factor; Properties of Engineering materials; Designation of materials as per IS and introduction to International standards & advantages of standardization; Use of design data book; Use of standards in design and preferred numbers series; Theories of Elastic Failures; Principal normal stress theory; Maximum shear stress theory & Maxi- mum distortion energy theory.

UNIT-II: Design of simple machine parts: Cotter Joint; Knuckle Joint; Turnbuckle; Design of Levers: Hand/Foot Lever & Bell Crank Lever; Design of C–Clamp; Off-set links; Overhang Crank; Arm of Pulley.

Antifriction Bearings: Classification of Bearings; Sliding contact & Rolling contact; Terminology of Ball bearings: Life Load relationship, Basic static load rating and Basic dynamic load rating, limiting speed; Selection of ball bearings using manufacturer's catalogue.

UNIT-III: Design of Shafts, Keys, Couplings and Spur Gears: Types of Shafts; Shaft materials; Standard Sizes; Design of Shafts (Hollow and Solid) using strength and rigidity criteria; ASME code of design for line shafts supported between bearings with one or two pulleys in between or one over- hung pulley; Design of Sunk Keys; Effect of Keyways on strength of shaft; Design of Couplings – Muff Coupling, Protected type Flange Coupling, Bush-pin type flexible coupling; Spur gear design considerations; Lewis equation for static beam strength of spur gear teeth; Power transmission capacity of spur gears in bending.

UNIT-IV: Design of Power Screws: Thread Profiles used for power Screws - Relative merits and de- merits of each; Torque required to overcome thread friction; Self-locking and overhauling property; Efficiency of power screws; Types of stresses induced; Design of Screw Jack; Toggle Jack.

Design of springs: Classification and Applications of Springs; Spring terminology; Materials and Specifications; Stresses in springs; Wahl's correction factor; Deflection of springs; Energy stored in springs; Design of Helical, Tension and Compression springs subjected to uniform applied loads like

I.C. engine valves, Weighing balance, Railway buffers and Governor springs; Leaf springs: Construction and Application.

UNIT-V: Design of Fasteners: Stresses in Screwed fasteners; Bolts of Uniform Strength; Design of Bolted Joints subjected to eccentric loading; Design of Parallel and Transverse fillet welds; Axially loaded symmetrical section; Merits and demerits of screwed and welded joints.

Ergonomics & Aesthetic consideration in design: Ergonomics of Design: Man–Machine relation-ship; Design of Equipment for control, environment & safety; Aesthetic considerations regarding shape, size, color & surface finish.

Reference Books:

1. Machine Design – Sadhu Singh, Khanna Book Publishing Co., Delhi (ISBN: 978-9382609-575)
2. Machine Design Data Book – Sadhu Singh, Revised Edition, Khanna Book Publishing Co., Delhi (ISBN: 978-9382609-513)
3. Introduction to Machine Design – V.B.Bhandari, Tata Mc- Graw Hill, New Delhi.
4. Mechanical Engineering Design – Joseph Edward Shigley, Tata Mc- Graw Hill, New Delhi.
5. Machine design – Pandya & Shah, Dhanpat Rai & Son, New Delhi.
6. Machine design – R.K.Jain, Khanna Publication, New Delhi.
7. Design Data Book – PSG Coimbtore, PSG Coimbtore.
8. Hand Book of Properties of Engineering Materials & Design Data for Machine Elements – Abdulla Shariff, Dhanpat Rai & Sons, New Delhi.

Course outcomes:

At the end of the course, the student will be able to:

1. Analyze the various modes of failure of machine components under different load patterns.
2. Design and prepare part and assembly drawings.
3. Use design data books and different codes of design.
4. Select standard components with their specifications from manufacturer's catalogue.
5. Develop drawings on CAD software.

RKDF UNIVERSITY RANCHI

DIPLOMA IN MECHANICAL ENGINEERING (DIPLOMA ME)

Branch	Subject Title	Subject Code
ME	**Advance Manufacturing Process**	DMEP503

Course Objectives

The objective of the course is to provide the student the knowledge of modern manufacturing processes such as Ultrasonic machining, Abrasive machining processes, Electrochemical machining, Electro discharge machining & their modification into hybrid processes. Also to introduce them to advanced topics such as laser beam welding/ machining, Electron beam welding/ machining & state of art in various research areas.

Module-I

Metal Cutting: Single and multi-point cutting; Orthogonal cutting, various force components: Chip formation, Tool wear and tool life. Surface finish and integrity, Machinability, Cutting tool materials, cutting fluids coating; Turning, Drilling, Milling and finishing processes, Introduction to CNC machining

Module-II

Metal Shaping and Forming: Metal working, Elastic and plastic deformation, Concept of strain hardening, Hot and cold working, Rolling, Principle and operations, Roll pass sequence, Forging, Forging operations, extrusion, Wire and tube drawing processes. Forging: Method of forging, Forging hammers and presses, Principle of forging tool design, Cold working processes: Shearing, Drawing Squeezing, Blanking, Piercing, deep drawing, Coining and embossing, Metal working defects, cold heading, Riveting, Thread rolling bending and forming operation. Numerical Calculation of Different process parameters of metal shaping and forming.

Module-III

Unconventional Machining Processes: Abrasive Jet Machining, Water Jet Machining Abrasive Water Jet Machining, Ultrasonic Machining principles and process parameters, Electrical Discharge Machining principle and processes parameters, MRR, surface finish tool wear, dielectric, power and control circuits, wire EDM; Electro-chemical machining (ECM), etchant & maskant, process parameters, MRR and surface finish. Laser Beam Machining (LBM), Plasma Arc Machining

(PAM) and Electron Beam Machining

Module-IV

Plastic, Ceramic and Glass Processing: Classification of Plastics, Ingredients of Moulding compounds, General Properties of Plastics, Plastic part manufacturing processes such as compression moulding, Transfer moulding, Injection moulding, Extrusion moulding, Blow moulding, Calendaring, Thermoforming, slush moulding, laminating. Ceramic Structure, Properties, and Applications, Shaping Ceramics, Glasses Structure, Properties, and Applications, Forming and shaping of glass, Composite materials, Processing of metal matrix and ceramic matrix composites, Processing semiconductors.

Course Outcomes

Students will be able to select material processing technique with the aim of costreduction, reducing material wastage & machining time. Students will be able to identify the process parameters affecting the product quality in various advanced machining of metals/ non-metals, ceramics and composites.

Books and References:

1. Kalpakjian and Schmid, Manufacturing processes for engineering materials (5th Edition)-Pearson India, 2014.
2. Mikell P. Groover, Fundamentals of Modern Manufacturing: Materials, Processes, andSystems.
3. Manufacturing Technology by P.N. Rao., MCGRAW HILL INDIA.
4. Materials and Manufacturing by Paul Degarmo.
5. Manufacturing Processes by Kaushish, PHI.
6. Principles of Foundry Technology, Jain, MCGRAW HILL INDIA
7. Production Technology by RK Jain.
8. Degarmo, Black &Kohser, Materials and Processes in Manufacturing.

RKDF UNIVERSITY RANCHI

DIPLOMA IN MECHANICAL ENGINEERING (DIPLOMA ME)

Branch	Subject Title	Subject Code
ME	**Refrigeration &Air conditioning**	DMEP504(E)

Unit-I

Introduction: Principles and methods of refrigeration, freezing; mixture cooling by gas reversible expansion, throttling, evaporation, Joule Thomson effect and reverse Carnot cycle; unit of refrigeration, coefficient of performance, vortex tube & thermoelectric refrigeration, adiabatic demagnetization; air refrigeration cycles- Joule's cycle Boot-strap cycle, reduced ambient cycle and regenerative cooling cycles.

Unit-II

Vapour compression system: Vapor compression cycle, p-h and t-s diagrams, deviations from theoretical cycle, sub-cooling and super heating, effects of condenser and evaporator pressure on cop; multi- pressure system: removal of flash gas, multiple expansion & compression with flash inter cooling; low temperature refrigeration: production of low temperatures, cascade system, dry ice, production of dry ice, air liquefaction system,.

Unit-III

(a) **Vapour absorption system**: Theoretical and practical systems such as aqua- ammonia, Electrolux & other systems;

(b) **Steam jet refrigeration**: Principles and working, simple cycle of operation, description and working of simple system,

(c) **refrigerants:** nomenclature & classification, desirable properties, common refrigeration, comparative study, leak detection methods, environment friendly refrigerants and refrigerant mixtures, brine and its properties

Unit-IV

Psychrometric: Calculation of psychrometric properties of air by table and charts; psychrometric processes: sensible heating and cooling, evaporative cooling, cooling and dehumidification, heating and humidification, mixing of air stream, sensible heat factor;

Principle of air conditioning, requirements of comfort air conditioning, ventilation standards,

infiltrated air load, fresh air load human comfort

Unit-V

Air conditioning loads: calculation of summer & winter air conditioning load, bypass factor of coil, calculation of supply air rate & its condition, room sensible heat factor, grand sensible heat factor, effective sensible heat factor, dehumidified air quantity.

References:

2. Arora CP; Refrigeration and Air Conditioning; TMH
3. Sapali SN; Refrigeration and Air Conditioning; PHI
4. Anantha narayan; Basic Refrigeration and Air conditioning; TMH
5. Manohar Prasad; Refrigeration and Air Conditioning; New Age Pub
6. Ameen; Refrigeration and Air Conditioning; PHI
7. Pita; Air conditioning Principles and systems: an energy approach; PHI
8. Stoecker W.F, JonesJ; Refrigeration and Air conditioning; McGH, Singapore

RKDF UNIVERSITY RANCHI

DIPLOMA IN MECHANICAL ENGINEERING (DIPLOMA ME)

Branch	Subject Title	Subject Code
ME	**MECHATRONICS**	DMEP505(E)

Course Objectives:

- To understand the basic concepts and characteristics of measurement systems.
- To learn various types of sensors and transducers various mechanical, electrical and pneumatic actuation systems.
- To learn various mechanical, electrical and pneumatic actuation systems.
- To learn the concepts of digital communications and develop PLC programs.
- To evaluate the performance of mechatronic systems.

Course Content:

UNIT-I: Introduction to Mechatronics: Mechatronics; Importance of Mechatronics; Systems: Measurement systems; Control systems and their types; Closed-loop control System; Automatic water level controller; Sequential controllers-washing machine

Measurement System terminology: Displacement, Position & Proximity Sensors; Velocity and Motion Sensors; Force Sensors; Fluid Pressure Sensors; Flow Sensors; Liquid Level Sensors; Temperature Sensors; Light Sensors; Selection of Sensors.

Unit-II: Mechanical Actuation Systems: Types of motion; Freedom and constraints; Loading; Gear Trains; Pawl & Ratchet; Belt & Chain drives; Bearings: Selection, Ball & Roller bearings; Mechanical aspects of motor selection.

Electrical Actuation Systems: Switches & Relays; Solenoids; D.C Motors; A.C. Motors; Stepper Motors: Specifications and Control of stepper motors; Servomotors: D.C Servomotor and A.C Servomotor.

Pneumatic & Hydraulic Systems: Power supplies; DCV; PCV; Cylinders; Rotary actuators.

Unit-III: Mathematical Model: Introduction to Mathematical model; Mechanical System building blocks; Electrical System building blocks; Fluid System building blocks; Thermal System building blocks.

System Model: Engineering Systems: Rotational, Translational Systems; Electro-Mechanical System; Hydro-Mechanical System.

Input/Output Systems: Interfacing; Input/output ports; Interface requirements: Buffers, Hand-shaking, Polling and interrupts, Serial interfacing; Introduction to PIA; Serial communications interface; Example of interfacing of a seven-segment display with a decoder.

Unit-IV: Programmable Logic Controller (PLC): Definition; Basic block diagram and structure of PLC; Input/Output processing; PLC Programming: Ladder diagram, its logic functions, Latching and Sequencing; PLC mnemonics; Timers; Internal relays and Counters; Shift registers; Master and JumpControls; Data handling; Analog input/output; Selection of PLC.

Unit-V: Design Examples & Advanced Applications in Mechatronics: Design process stages; Traditional Vs Mechatronics designs; Possible design solutions: Timed switch, Wind-screen wiper motion, Bath room scale; Case studies of Mechatronics systems: A pick-and-place robot, Car park barrier, Car engine management system, Automatic Camera and Automatic Washing Machine only.

Sensors for Condition Monitoring Systems of Production Systems: Examples of Monitoring methods: Vibration monitoring, Temperature monitoring, Wear behavior monitoring; Mechatronics control in automated manufacturing: Monitoring of Manufacturing processes, On-line quality monitoring, Model based systems, Hardware in-the-loop simulation, Supervisory control in manufactur- ing inspection, Integration of heterogeneous systems.

Reference Books:

1. Mechatronics – W. Bolton, Pearson Education India.
2. A Text Book on Mechatronics – R.K.Rajput, S.Chand& Co, New Delhi.
3. Mechatronics – M.D.Singh & Joshi, Prentice Hall of India.
4. Mechatronics – HMT, Tata McGraw Hill, New Delhi.
5. Mechatronics System – Devadas Shetty, PWS Publishing
6. Exploring Programmable Logic Controllers with applications – Pradeep Kumar Srivatsava, BPB Publications.

Course outcomes

At the end of the course, the student will be able to:

1. Describe about various types of sensors and transducers.
2. Explain the various mechanical, electrical and pneumatic actuation systems.
3. Explain the basic mathematical building blocks for mechanical, electrical, thermal and fluid actuation system and its interfacing of input/output requirements.
4. Explain the basic PLC architecture and PLC programming concepts.
5. Describe the design examples of mechatronics system. Explain the condition monitoring of 1. production systems using sensors.

RKDF UNIVERSITY RANCHI

DIPLOMA IN MECHANICAL ENGINEERING (DIPLOMA ME)

Branch	Subject Title	Subject Code
Mechanical Engineering	**Installation & Maintenance**	DMEP506(E)

RATIONALE:

A mechanical engineering diploma holder is in demand as maintenance supervisor. In the capacity of a supervisor he has to tackle the problem of installation and commissioning of machines. He is expected to plan maintenance schedule and to upkeep machines in operating condition. Spot decisions are to be taken about replacement, restoration and recovery of machine parts.

The subject has been designed to develop sufficient knowledge which will keep in developing skill and attitude in students so that when engaged in any industry he may be able discharge his duties in confidence.

OBJECTIVES:

A student after successful completion of the subject will be able to

1. Understand the problem in installation of machine and equipment.
2. Organize the maintenance activities.
3. Develop the knowledge of methods of determining wear.
4. Select repair methods of worn parts and their sequence.
5. Understand the common defects and their repair/restoration and removal of machine parts.
6. Ensure uninterrupted production flow.

RKDF UNIVERSITY RANCHI

DIPLOMA IN MECHANICAL ENGINEERING (DIPLOMA ME)

COURSE CONTENTS:

1.0	**Safety** 1.1 Safety in Industry	
	1.2 Need for safety	
	1.3 Personal protective equipments	
	1.4 Fire hazards	
	1.5 Fire fighting equipments	
	1.6 First aid	
2.0	**Generalised Procedure of Installation** 2.1 Introduction to installation activities	
	2.1.1 Location and layout of machines	
	2.1.2 Positioning of machine	
	2.1.3 Foundation-Design criteria of foundation-Foundation bolts	eye-Foundation bolts:

Reg bolts, lewis bolt, cotter bolt, split end bolts-Major activities of foundation work.

Leveling and alignment measuring instruments used in leveling

Grouting

Fitting leveling and test runs

Test chart

Test chart for a general purpose lathe

Maintenance and Repair of Guide Surface

Introduction to guide surface. Types of guide ways.

Causes of mechanical wear on guide surface. Methods of measuring the extent of wear.

Checking of guide ways for their straightness, special twist and parallility along the horizontal and vertical planes. Setting of universal bridge for controlling guide surface characteristics on prism guide, prism andflat guide, vee and flat guide. General method of repair of guide surfaces: scarping, grinding and machining.

Mounting, Maintenance and Repair Techniques of Power Transmission Devices

Introduction to different types of keys and their application.

Fitting of keys.

Repair methods of worn out keys.

Introduction to spline fittings.

Repair, milling, slotting and broaching of splines.

Introduction to couplings and their types

Common defects of coupling and coupling failure and repair.

Bearings.

Introduction to plain bearings and anti friction bearings.

Assembly of plain bearings and their mounting techniques.

Limiting wear of the bush used under different load conditions and its rectification bybi-metal lings and babbitting.

Antifriction bearing mounting.

Major failure factors and corrective action.

Clutches

Introduction to clutches and their types.

Common defects of clutches and their repair.

Transmission Gears

Introduction to transmission gears with their specific applications.

Gears mounting.

Repair method and checking for correct meshing of the spur gears.

Belt Drives

Belt joining – endless method, lace joint, metallic joint.

Installation of belts and maintenance of belting.

Chain drive

Roller chain drive and silent chain drive.

Chain wear and repair, sprocket wear and repairing.

Erection and maintenance of sprockets and chains.

Repair of Jaw Chuck, Tailstock and Cracks in Cast Iron Body

Repair & maintenance of three jaw chuck

Repair of tail stock

Repair of taper hole and wear on guide surface.

Repair of cracks on C.I. body

Repair of cracks by riveting headless copper screws.

5.3.2. Repair of cracks on machine bed and anvil by hot clapping.

5.3.3 Repair of cracks by araldite or stell on compounds.

Seals, Packing and Gaskets

Introduction to static seal (gasket). Classification of seals, dynamic seal, labyrinth seal.

Application of different types of seals on fixed joints on reciprocating parts, on rotating shaft.

Reconditioning of I.C. Engine

Decarburisation

Reboring of the engine cylinder

Sleeving

Crankshaft conditioning

Replacement of cylinder head packing

Valve grinding and valve setting

Operational troubles of a diesel engine-causes and remedies

Trouble shooting of petrol engines-causes and remedies

Pumps and Air Compressors

Introduction to basic elements of centrifugal, reciprocating and gear pumps

Pumping units, connection of pumps with suction lines and discharges line.

Alignment test of pumps and driver shaft.

Preparatory steps of starting a pumping unit, procedural steps for starting, operating andstopping of pumping unit.

Reciprocating pumps – types, working principles.

Installation of a reciprocating pumps

Caution on opening the pump.

Air compressors

Introduction to different types of air compressors.

Maintenance schedule of reciprocating compressor.

Lubrication and Lubricants

Introduction – function of lubrication, modes of lubrication, boundry lubrication, Fluid Film lubrication, Mixed lubrication of machine.

Types of lubrication system, lubrication of machine tools, lubricating instruction.

Properties of lubricants, types of lubricants, additives and selection of lubricants.

Miscellaneous Maintenance

Discuss materials and pipe fitting.

Major causes of faults-Leakages, swaying of pipes, water hammer, corrosion.

Steam piping and fitting arrangement.

Pipe joints, pipe welding, expansion bends, pipe supports.

Pipe line installation, repair of pipe lines.

Dust collectors-gravity separators, cycle separators, packed tower separators, electrostatic separator and their maintenance

Hydraulic and Pneumatic system

Introduction to hydraulic & pneumatic system

Basic circuits

Maintenance of valves, actuators, pipe lines, motor, pump & compressor

Safety valves, relief valves & directional valves

RKDF UNIVERSITY RANCHI

DIPLOMA IN MECHANICAL ENGINEERING (DIPLOMA ME)

Branch	Subject Title	Subject Code
Mechanical Engineering	**Power Plant Engineering**	DMEP507(E)

Course Objective:

- To introduce students to different aspects of power plant engineering.
- To familiarize the students to the working of power plants based on different fuels.
- To expose the students to the principles of safety and environmental issues.

UNIT I

INTRODUCTION & ECONOMICS OF POWER PLANT

Power plant-Introduction, Classification - Location of power plant- Choice of Power plant Terminology used in power plant: Peak load, Base load, Load factor, Load curve, demand factor-Various factor affecting the operation of power plant- Load sharing- cost of power tariff methods-factors involved in fixing of a tariff.

UNIT II

HYDRO POWER PLANT

Hydro electric power plant- Introduction, storage and poundage, Selection of sites for hydro electric power plant-General layout and essential elements of Hydro electric power plant and its working-Classification of the plant- base load plant, peak load plant, Run off river plant, storage river plant, pumped storage plant, mini and micro hydel plants, governing of hydraulic turbines-impulse turbine-reaction turbine, selection of turbines, Advantages and disadvantages-limitations of hydro electric power plant.

UNIT III

THERMAL POWER PLANT

Thermal power plant -General layout, working, Site Selection, materials required for thermal power plants, coal handling and its methods, stages in coal storage, Fuel burning-Stoker firing, overfeed stoker, under feed stokers, chain grate stoker, Pulverized fuel handling system-unit and central system, Pulverization of coal-Ball mill, Ash handling system, Gravity system, electrostatic

precipitation (ESP) system, Feed water treatment- Mechanical method, Advantages and disadvantages and limitations of Thermal power plant.

UNIT IV

NUCLEAR POWER PLANT & GAS TURBINE POWER PLANTS

Nuclear power plant-introduction-nuclear fuels, nuclear fission and fusion, working of a nuclear power plant, types of reactors- pressurized water reactor- boiling water reactor, effects of nuclear radiation, different methods for nuclear waste disposal-low, medium and high level waste disposal, Advantages -disadvantages- limitations. Gas turbine power plant- Schematic diagram & working of open and closed cycle gas turbine power plant, Components of Gas turbine–compressor, combustion chamber, gas turbine, gas turbine fuels, Advantages -disadvantages- limitations of Gas turbine powerplant

UNIT V

SOLAR, WIND AND DIESEL POWER PLANTS.

Solar power plant-introduction, layout, Solar cell fundamentals & classification – maximum power point tracker (MPPT) and solar panel.

Wind power plant: introduction, Factors affecting distribution of Wind energy, Variation of wind speed with height and time-Horizontal axis wind turbine (HAWT)-types of rotors Vertical axis wind turbine- types of rotors- Wind energy conversion system (WECS) advantages and disadvantages-limitations of Wind power plant.

Diesel power plant- layout, Components and working- Advantages –disadvantages, limitations.

UNIT VI

PLANT SAFETY AND ENVIRONMENTAL IMPACT OF POWER PLANT

Social and Economical issues of power plant- Oxides of sulphur, oxides of carbon, oxides of nitrogen, Acid precipitation-Acid rain- acid snow- Dry deposition-acid fog, green house effect, air and water pollution from thermal power plants and its control, Thermal pollution from thermal power plants, noise pollution and its control, natural and artificial radioactivity nuclear power and environment- radiations from nuclear power plant effluents- high level wastes- methods to reduce pollution, global warming- its effects and control, standardization for environmental pollution.

Reference Books:

1. Power Plant Engineering" Mahesh Verma, Metropolitan Book Company Pvt. Ltd.New Delhi
2. "Power Plant Technology" El-Vakil, McGraw Hill.
3. Power Plant Engineering by P.K. Nag, Tata McGraw Hill.
4. Steam & Gas Turbines & Power Plant Engineering by R.Yadav, Central Pub.House.

Course Outcomes:

At the end of the course, a student will be able to:

1. Describe and analyze different types of sources and mathematical expressions related to thermodynamics and various terms and factors involved with power plant operation.
2. Analyze the working and layout of steam power plants and the different systems comprising the plant and discuss about its economic and safety impacts
3. Combine concepts of previously learnt courses to define the working principle of diesel power plant, its layout, safety principles and compare it with plants of other types.
4. Describe the working principle and basic components of the nuclear power plant and the economic and safety principles involved with it.
5. Discuss the working principle and basic components of the hydroelectric plants and the economic principles and safety precautions involved with it

. 6. Discuss and analyze the mathematical and working principles of different electrical equipment's involved in the generation of power.

RKDF UNIVERSITY RANCHI

DIPLOMA IN MECHANICAL ENGINEERING (DIPLOMA ME)

Branch	Subject Title	Subject Code
Mechanical Engineering	**Hybrid Vehicles**	DMEP508(E)

Course Objectives:

- To understand the basics of electric vehicle history and components.
- To understand properties of batteries.
- To understand the electrical machine properties and classifications.
- To understand the properties of electric vehicle drive systems
- To understand the concepts of hybrid electric vehicles.

Course Content:

UNIT-I: Electric Vehicles: Introduction; History of Hybrid and Electric Vehicles; Social and Environmental importance of Hybrid and Electric Vehicles; Components, Vehicle mechanics: Roadway fundamentals, Vehicle kinetics, Dynamics of vehicle motion; Propulsion System Design.

Unit-II: Battery: Basics; Types; Parameters: Capacity, Discharge rate, State of charge, State of Discharge, Depth of Discharge; Technical characteristics, Battery pack Design, Properties of Batteries.

Unit-III: DC & AC Electrical Machines: Motor and Engine rating; Requirements; DC machines; Three phase A/c machines; Induction machines; Permanent magnet machines; Switched reluctance machines.

Unit-IV: Electric Vehicle Drive Train: Transmission configuration; Components: Gears, Differential, Clutch, Brakes; Regenerative braking, Motor sizing; Fuel efficiency analysis.

Unit-V: Hybrid Electric Vehicles: Types: Parallel, Series, Parallel and Series configurations; Drive

train; Sizing of components; Basics of Micro, Mild, Mini, Plug-in and Fully hybrid.

Reference Books:

1. Electric & Hybrid Vehicles – A.K. Babu, Khanna Publishing House, New Delhi, 2018
2. Electric & Hybrid Vehicles – Design Fundamentals - Iqbal Hussain, Second Edition, CRC Press,2011.
3. Electric Vehicle Technology Explained - James Larminie, John Wiley & Sons, 2003.
4. Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals - Mehrdad Ehsani, YiminGao, Ali Emadi, CRC Press, 2010.
5. Electric Vehicle Battery Systems - Sandeep Dhameja, Newnes, 2000.

Course outcomes:

At the end of the course, the student will be able to:

1. Understand the basics of electrical vehicle history and components.
2. Understand the properties of batteries.
3. Understand the electrical machine properties and classifications.
4. Understand the properties of electrical vehicle drive systems.
5. Understand the concepts of hybrid electric vehicles.

RKDF UNIVERSITY RANCHI

DIPLOMA IN MECHANICAL ENGINEERING (DIPLOMA ME)

Branch	Subject Title	Subject Code
Mechanical Engineering	**Material Handling System**	DMEP509(E)

Course Objectives:

- To know the operational features of the material handling equipment & its practical applications.
- To understand, select, operate and maintain the material handling equipment's.
- To understand different material handling processes used in industries.
- To understand & appreciate safety instrumentation for equipment.

Course Content:

UNIT-I: Introduction to Material Handling System: Main types of Material handling equipment & their applications; Types of load to be handled; Types of Movements; Methods of stacking, loading & unloading systems; Principles of Material Handling Systems; Modern trends in Materials handling.

UNIT-II: Hoisting Machinery & Equipment: Construction, Working & Maintenance of different types of hoists such as Lever operated hoist, Portable hand chain hoist, Differential hoists, Worm geared and Spur geared hoists, Electric & Pneumatic hoists, Jumper; Construction, Working & Maintenance of different types of cranes such as Rotary cranes, Trackless cranes, Mobile cranes, Bridge cranes, Cable cranes, Floating cranes & Cranes traveling on guide rails; Construction, Working & Maintenance of Elevating equipments such as Stackers, Industrial lifts, Freight elevators, Passengerlifts, and Mast type's elevators, Vertical skip hoist elevators.

UNIT-III: Conveying Machinery: Construction, Working & Maintenance of Traction type convey- ors such as Belt conveyors, Chain conveyors, Bucket elevators, Escalators; Construction, Working & Maintenance of Traction less type conveyors such as Gravity type conveyors, Vibrating & Oscillating conveyors, Screw conveyors, Pneumatic & Hydraulic conveyors, Hoppers gates & Feeders.

Surface Transportation Equipment: Construction, Function, Working of Trackless equipment such as Hand operated trucks, Powered trucks, Tractors, Automatic Guided vehicle, Industrial Trailers; Construction, Function, Working of Cross handling equipment such as Winches, Capstans, Turntables, Transfer tables, Monorail conveyors.

UNIT-IV: Components of Material Handling Systems: Flexible hoisting appliances such as Welded load chains, Roller chains, Hemp ropes, Steel wire ropes, Fastening methods of wire & chains, Eye bolts, Lifting tackles, Lifting & Rigging practices; Load handling attachments: a) Various types of hooks-Forged, Triangular eye hooks, Appliances for suspending hooks b) Crane grab for unit & piece loads c) Electric lifting magnet, vacuum lifter. d) Grabbing attachment for loose materials e) Crane attachment for handling liquids/molten metals; Construction & Working of Arresting gear & Brakes; Construction & use of electromagnetic shoe brakes, Thruster operated shoe brakes, Control brakes.

UNIT-V: Mechanism used in Material Handling Equipment: Steady state motion; Starting & stop- ping of motion in following mechanisms: Hoisting mechanism, Lifting Mechanism, Traveling Mechanism, Slewing Mechanism, Rope & chain operated Cross- Traverse Mechanism.

Selection of Material Handling Equipment: Factors affecting choice of material handling equipment such as Type of loads, Hourly capacity of the unit, Direction & length of travel, Methods of stocking at initial, final & intermediate points, Nature of production process involved, Specific load conditions & Economics of material handling system.

Reference Books:

1. Material handling (Principles & Practice) – Allegri T. H., CBS Publisher, New Delhi.
2. Plant Layout & Materials Handling – Apple J. M., JohnWiley Publishers.
3. Material Handling Equipment – N. Rundenko, Peace Publisher, Moscow.
4. Material Handling Equipment – M. P. Alexandrov, MIR Publisher, Moscow.
5. Material Handling Equipment – Y. I. Oberman, MIR Publisher, Moscow.

Course outcomes

At the end of the course, the student will be able to:

1. Understand constructional & operational features of various materials handling systems
2. Identify, compare & select proper material handling equipment for specified applications.
3. Know the controls & safety measures incorporated on material handling equipment.
4. Appreciate the role of material handling devices in mechanization & automation of industrial process.
5. Understand & appreciate safety instrumentation for equipment

RKDF UNIVERSITY RANCHI

DIPLOMA IN MECHANICAL ENGINEERING (DIPLOMA ME)
New Scheme Based on AICTE Flexible Curricula

Semester–V

Branch	Subject Title	Subject Code
ME	**Solid Waste Management**	DMEO510(E)

Course Objectives:

Following are the objectives of this course:

• To know various sources of solid.

• To learn techniques of collection and transportation of solid waste.

• To know various methods of disposal of solid waste.

• To understand and identify different biomedical and E-waste and their subsequent disposal techniques.

Course Content:

Unit – I Introduction

- Definition of solid waste, different solid waste – domestic Waste, commercial waste, industrial
- waste, market waste, agricultural waste, biomedical waste, E-waste, hazardous waste,
- institutional waste, etc.
- Sources of solid waste, Classification of solid waste – hazardous and non- hazardous waste.
- Physical and chemical characteristics of municipal solid waste.

Unit– II Storage, Collection and Transportation of Municipal Solid Waste

- Collection, segregation, storage and transportation of solid waste.
- Tools and Equipment-Litter Bin, Broom, Shovels, Handcarts, Mechanical road sweepers,
- Community bin - like movable and stationary bin.
- Transportation vehicles with their working capacity -Animal carts, Auto vehicles, Tractors
- or Trailers, Trucks, Dumpers, Compactor vehicles. Transfer station- meaning, necessity, location.
- Role of rag pickers and their utility for society.

Unit– III Composting of Solid Waste

- Concept of composting of waste, Principles of composting process. Factors affecting the
- Composting process.
- Methods of composting – Manual Composting – Bangalore method, Indore Method, , Vermi composting.

Unit IV Techniques for Disposal of Solid Waste

- Solid waste management techniques – solid waste management hierarchy, waste prevention and waste reduction techniques
- Land filling technique, Factors to be considered for site selection, Land filling methods-Area method, Trench method and Ramp method, Leachate and its control, Biogas from landfill,
- Advantages and disadvantages of landfill method, Recycling of municipal solid waste
- Incineration of waste: Introduction of incineration process, Types of incinerators - Flash, Multiple chamber Incinerators, Products of incineration process with their use, Pyrolysis of waste – Definition, Methods 113 Civil Engineering Curriculum Structure

Unit– V Biomedical and E-waste management

- Definition of Bio medical Waste.
- Sources and generation of Biomedical Waste and its classification
- Bio medical waste Management technologies.
- Definition, varieties and ill effects of E- waste,
- Recycling and disposal of E- waste.

Suggested learning resources:

1. Gupta O.P, Elements of Solid Hazardous Waste Management, Khanna Book Publishing Co.,
1. Delhi Ed. 2018
2. Bhide, A. D., Solid Waste Management, Indian National Scientific Documentation Centre, New Delhi.
3. George Techobanoglous, Kreith, Frank., Solid Waste, McGraw Hill Publication, New Delhi.
4. Sasikumar, K., Solid Waste Management, PHI learning, Delhi.
5. Hosetti, B.B., Prospect and Perspectives of Solid Waste Management, New Age International
6. Publisher.

Course outcomes:

After competing this course, student will be able to:

• Identify the sources of solid waste.

• Select the relevant method of collection and transportation of solid waste.

• Suggest an action plan for composting of solid waste.

• Devise suitable disposal technique for solid waste

• Use the relevant method for disposal of Bio-medical and E-waste

RKDF UNIVERSITY RANCHI

DIPLOMA IN MECHANICAL ENGINEERING (DIPLOMA ME)

Branch	Subject Title	Subject Code
Mechanical Engineering	Industrial Instrumentation	DMEO511(E)

COURSE OBJECTIVES:

1 To introduce the measurement techniques of force, torque and sped.

2. To introduce the measurement techniques of acceleration, Vibration and density

3.To introduce the measurement Viscosity, Humidity and moisture.

4 To introduce the temperature measurement techniques

5. To introduce the pressure measurement techniques

UNIT I MEASUREMENT OF FORCE, TORQUE AND SPEED

Load Cell introduction, Different types of load cells: Hydraulic, Pneumatic, Strain gauge, Magneto-elastic and Piezoelectric load cells – Different methods of torque measurement: Strain gauge, Relative angular twist. Speed measurement: Capacitive tacho, Drag cup type tacho, D.C and A.C tacho generators – Stroboscope.

UNIT II MEASUREMENT OF ACCELERATION, VIBRATION AND DENSITY

Accelerometers: LVDT, Piezoelectric, Strain gauge and Variable reluctance type accelerometers – Mechanical type vibration instruments – Seismic instruments as accelerometer – Vibration sensor – – Units of density and specific gravity: Pressure type densitometers, Float type densitometers, Ultrasonic densitometer and gas densitometer.

UNIT III MEASUREMENT OF VISCOSITY, HUMIDITY AND MOISTURE

Viscosity: Say bolt viscometer – Rotameter type and Torque type viscometers – Consistency Meters – Humidity: Dry and wet bulb psychrometers – Resistive and capacitive type hygrometers – Dew cell – Commercial type dew meter. Moisture: Different methods of moisture measurements – Thermal, Conductivity and Capacitive sensors, Microwave, IR and NMR sensors, Application of moisture measurement – Moisture measurement in solids.

UNIT IV TEMPERATURE MEASUREMENT

Definitions and standards – Primary and secondary fixed points – Different types of filed in system thermometers – Sources of errors in filed in systems and their compensation – Bimetallic

thermometers – IC sensors – Thermocouples: Laws of thermocouple, Fabrication of industrial thermocouples, Reference junctions compensation, – Radiation fundamentals – Radiation methods of temperature measurement – Total radiation pyrometers – Optical pyrometers – Two colour radiation pyrometers – Fibre optic sensor for temperature measurement – Thermograph, Temperature

switches and thermostats – Temperature sensor selection, Installation and Calibration.

UNIT V PRESSURE MEASUREMENT

Units of pressure – Manometers: Different types, Elastic type pressure gauges: Bourdon tube, Bellows, Diaphragms and Capsules – Electrical methods: Elastic elements with LVDT and strain gauges – Capacitive type pressure gauge – Piezo resistive pressure sensor-Resonator pressure sensor – Measurement of vacuum: McLeod gauge, Thermal conductivity gauge, lionization gauges, Cold cathode type and hot cathode type – Pressure gauge selection, installation and calibration using dead weight ester.

Course outcomes:

After studying this course students will be able to

1. Describe the basic principle of transducers
2. Applications of transducers in real world
3. Measurement, calibration and signal conditioning of transducers.

RKDF UNIVERSITY RANCHI

DIPLOMA IN MECHANICAL ENGINEERING (DIPLOMA ME)

Branch	Subject Title	Subject Code
ME	Web Technology	DMEO512(E)

Objectives: Giving the students the insights of the Internet programming and how to design and implement complete applications over the web.

Unit-I

Internet Fundamentals :Motivation for internetworking History and scope of internet Internet protocol and standardization 1.4 Role of ISP & Factors for choosing an ISP 1.5 Internet Service providers in India 1.6 Types of connectivity such as Dial Up, Leased, VSAT etc. 1.7 Internet server and client modules on various operating systems

Unit-II

TCP/ IP : 2.1 TCP/IP internet layering model 2.2 Reliable stream transport service(TCP) 2.3 Need for stream delivery 2.4 Properties of reliable delivery service 2.5 Providing reliability 2.6 Idea behind slide windows 2.7 Ports connection and end points Segment, stream, sequence number 2.8 TCP segment format,TCP header.

Unit-III

Internet Application and Services : 3.1 Email 3.2 Email networks 3.3 Email protocols 3.4 Formatof an email address 3.5 Email routing 3.6 Email clients, POP3, IMAP 3.7 FTP 3.8 Public domain software 3.9 Types of FTP servers 3.10 FTP clients 3.11 Telnet 3.12 Telnet protocols 3.13 Server domain 3.14 Telnet clients 3.15 Terminal emulation 3.16 Internet Relay Chat 3.17 IRC network and servers 3.18 Channels

Unit-IV

E-Commerce : 4.1 Introduction to Electronic commerce 4.2 Modes of electronic commerce 4.3 Electronic data interchange 4.4 Migration to OPEN EDI 4.5 Electronic commerce with www/Internet 4.6 Different types of Electronics Payment SystemCredit card, Debit card, Smart Card, E-Cash ,E-Wallet

Unit-V

Web Publishing and Browsing : 5.1 Overview, SGML,HTML 5.2 Web hosting 5.3 CGL, Documents Interchange Standards 5.4 Components of Web Publishing, Document management 5.5 Web Page Design, Consideration and Principles 5.6 Search and Meta Search Engines 5.7 WWW, Browser, HTTP, Publishing Tools

Unit-VI

Interactivity Tools : CGI, XML, ActiveX, VB Script, JAVA Script, Front Page, Adobe Dreamweaver, Flash

References

1. Internet working with TCP/IP VOl-1 : Principles Protocol and Architecture by-Douglas E Comer –PH
2. Internet working with TCP/IP VOL-2 : Design , Implementation and Internals by- Douglas E Comer, David L. Stevens- PHI
3. HTML: the Definitive guide –lby Chuck Musciano& Bui Kennedy4
4. Learning PHP, MySQL & JavaScript with jQuery, CSS & HTML5 by Robin Nixon

The student will be able to:

- Analyze a web page and identify its elements and attributes.
- Create web pages using XHTML and Cascading Style Sheets.
- Build dynamic web pages using JavaScript (Client side programming).
- Create XML documents and Schemas

RKDF UNIVERSITY RANCHI

DIPLOMA IN MECHANICAL ENGINEERING (DIPLOMA ME)

Branch	Subject Title	Subject Code
Mechanical Engineering	Industrial Management	**DMEP601**

Course Objectives

The course enables students to understand basic principles/concepts of:

1. Industrial management and organization;
2. Industrial plant design;
3. Effective material management;
4. Management and resource allocation; and Engineering economy

1. **Productivity:**

Production and productivity, importance of productivity, factors affecting productivity, means of increasing productivity.

2. **Plant Layout and Material Handling:**

Definition of plant layout, objectives of good plant layout, principles of plant layout, types of plant layout, flow pattern, steps in planning the layout for a new enterprise, definition of material handling, functions and principles of material handling, material handling devices.

3. **Work Study:**

Definition, concept and need for work study, objectives of method study and work measurement, basic procedure/steps in method study, recording technique, critical examination, principles of motion economy, stop watch procedure for collecting time study data, including performance rating and allowances, work sampling.

4. **Production Planning and Control (PPC):**

Definition and objectives of PPC, functions of PPC, routing, scheduling, loading, dispatching, production control: definition and objectives, principle of sound production control system.

5. **Material, Purchase and Stores Management:**

Definition, functions & objectives of materials management, inventory control, economic order quantity (EOQ), ABC analysis. Objectives of purchasing department, buying techniques, purchasing procedure (steps involved in one complete purchasing cycle); functions of stores department, location and layout of stores, receipt and issue of materials.

6. **Quality Control and TQM:**

Meaning of quality and quality control dimensions of quality, quality circle, concept and definition of TQM, elements of TQM, Kaizen, 5'S' and six sigma.

7. **Management**: Various definition, concept of management, levels of management, administration and management, scientific management by F.W. Taylor, Principles of management (14 principles)

8. **Organizational Management:** Organization - definition, steps in forming organization. Types of organization. Types of organization- line, line and staff, functions, project type. Departmentation- Organized and decentralized, authority and responsibility span of control (management). Forms of ownership- proprietorship, partnership, Joint Stock Company, co-operative society, govt. sector.

9. **Human Resource Management:** Personnel Management– Introduction, definition, function. Staffing – Introduction to HR, Introduction to HR Planning, Recruitment procedure. Personnel-Training & Development– Types of training, Induction, Skill enhancement. Leadership & Motivation–Leadership-Styles & types, Motivation- Definition, Intrinsic, & Extrinsic, Moslow's theory of Motivation and its significance.

10. **Financial Management:** Financial Management- Objectives & Functions. Capital Generation & Management- Types of capitals, Sources of finance. Budgets and accounts- Types of budgets, Production budget (including variance report), Labour budget, Introduction to Profit & Loss Accounts (Only concept), Balance sheet etc.

11. **Entrepreneurship:** Concept and definition of entrepreneur and entrepreneurship, factors influencing entrepreneurship, entrepreneurial characteristics, need for promotion of entrepreneurship and small scale industries, steps in setting up a small scale industrial enterprise.

References Books:

1. Industrial Engineering and Management by O.P. Khanna
2. Industrial Engineering and Production Management by M. Mahajan. Publisher: Dhanpat Rai Publication (P)Ltd. New Delhi
3. Business Administration and Management by Dr. S. C. Saksena Publisher: Sahitya Bhawan, Agr

RKDF UNIVERSITY RANCHI

DIPLOMA IN MECHANICAL ENGINEERING (DIPLOMA ME)

Branch	Subject Title	Subject Code
Mechanical Engineering	Entrepreneurship	**DME602**

Course Learning Objectives:

1. Acquiring Entrepreneurial spirit and resourcefulness.
2. Familiarization with various uses of human resource for earning dignified means of living.
3. Understanding the concept and process of entrepreneurship - its contribution and role in the growth and development of individual and the nation.
4. Acquiring entrepreneurial quality, competency, and motivation.
5. Learning the process and skills of creation and management of entrepreneurial venture.

UNIT-I

IntroductiontoEntrepreneurshipMeaningandconceptofentrepreneurship,thehistoryofentrepreneurship development, role of entrepreneurship in economic development, Myths about entrepreneurs, agencies in entrepreneurship management and future of entrepreneurship types of entrepreneurs.

UNIT-II

The Entrepreneur Why to become entrepreneur, the skills/ traits required to be an entrepreneur, Creative and Design Thinking, the entrepreneurial decision process, skill gap analysis, and role models, mentors and support system, entrepreneurial success stories.

UNIT-III

E-Cell Meaning and concept of E-cells, advantages to join E-cell, significance of E-cell, various activities conducted by E-cell

UNIT-IV

Communication Importance of communication, barriers and gateways to communication, listening to people, the power of talk, personal selling, risk taking & resilience, negotiation.

UNIT-V

Introduction to various form of business organization (sole proprietorship, partnership, corporations, Limited Liability company), mission, vision and strategy formulation

Reference Books:

1. Udyamita by Dr.MMP. Akhouriand S.P Mishra, pub. By National Institute for Entrepreneurship and Small Business Development(NIESBUD),NSIC-PATC Campus, Okhla
2. EverydayEntrepreneurs-TheharbingersofProsperityandcreatorsofJobs-Dr.ArunaBhargava.

Learning Outcome:

Upon completion of the course, the student will be able to demonstrate knowledge of the following topics:

1. Understanding the dynamic role of entrepreneurship and small businesses
2. Organizing and Managing a Small Business
3. Financial Planning and Control
4. Forms of Ownership for Small Business
5. Strategic Marketing Planning
6. New Product or Service Development
7. Business Plan Creation

SUGGESTED LEARNING RESOURCES:

S. No.	Title of Book	Author	Publication
1.	The Startup Owner's Manual: The Step-by-Step Guide for Building a GreatCompany	Steve Blank and Bob Dorf	K & S Ranch ISBN – 978-0984999392
2.	The Lean Startup: How Today's Entre-preneurs Use Continuous Innovation to Create Radically Successful Businesses	Eric Ries	Penguin UK ISBN – 978-0670921607
3.	Demand: Creating What People Love Before They Know They Want It	Adrian J. Slywotzkywith Karl Weber	Headline Book Publishing ISBN – 978-0755388974
4.	The Innovator's Dilemma: The Revolu- tionary Book That Will Change the WayYou Do Business	Clayton M. Chris-tensen	Harvard business ISBN: 978-142219602

SUGGESTED SOFTWARE/LEARNING WEBSITES:

a. https://www.fundable.com/learn/resources/guides/startup

b. https://corporatefinanceinstitute.com/resources/knowledge/finance/corporate-structure/

c. https://www.finder.com/small-business-finance-tips

https://www.profitbooks.net/funding-options-to-raise-startup-capital-for-your-business/

RKDF UNIVERSITY RANCHI

DIPLOMA IN MECHANICAL ENGINEERING (DIPLOMA ME)

Branch	Subject Title	Subject Code
Mechanical Engineering	Environmental Science	DME603

Course Objectives:

According to UNESCO (1971), the objectives of environmental studies are:

(a) Creating the awareness about environmental problems among people.

(b) Imparting basic knowledge about the environment and its allied problems.

(c) Developing an attitude of concern for the environment.

Module-I

Introduction to environmental studies and Ecosystems

Multidisciplinary nature of environmental studies; Scope and importance; Concept of sustainability and sustainable development, ecosystem, Structure and function of ecosystem; Energy flow in an ecosystem: food chains, food webs and ecological succession, Case studies of the following ecosystems:Forest ecosystem ,Grassland ecosystem ,Desert ecosystem Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

Module-II

Natural Resources: Renewable and Non-renewable Resources

Land resources and land use change; Land degradation, soil erosion and desertification, Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations, Water: Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter-state), Energy resources: Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs, case studies.

Module-III

Biodiversity and Conservation & Environmental Pollution

Levels of biological diversity: genetic, species and ecosystem diversity; Biogeographic zones of India; Biodiversity patterns and global biodiversity hot spots, India as a mega-biodiversity nation; Endangered and endemic species of India, Threats to biodiversity: Habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions; Conservation of biodiversity: In-situ and Ex-situ conservation , Environmental pollution: types, causes, effects and controls; Air, water, soil and

noise pollution ,Nuclear hazards and human health risks ,Solid waste management: Control measures of urban and industrial waste ,Pollution case studies.

Module-IV

Environmental Policies- Practices and Human communities

Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture, Environment Laws: Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act. International agreements: Montreal and Kyoto protocols and Convention on Biological Diversity (CBD), Human population growth: Impacts on environment, human health and welfare, Resettlement and rehabilitation of project affected persons; case studies, Disaster management: floods, earthquake, cyclones and landslides. Case studies (e.g., factory pollution in Ranchi)

Reference Books

1. Blackwell's Concise Encyclopedia of Ecology by Peter Calow. ...
2. Blackwell's Concise Encyclopedia of Environmental Management by Peter Calow. ...
3. Conservation and Environmentalism by Robert C. ...
4. Encyclopedia of Biodiversity by Simon A. ...
5. Encyclopedia of Disasters by Angus M.

Course Learning Outcomes

The course will empower the undergraduate students by helping them to:

i. Gain in-depth knowledge on natural processes that sustain life, and govern economy.

ii. Predict the consequences of human actions on the web of life, global economy and quality of human life.

iii. Develop critical thinking for shaping strategies (scientific, social, economic and legal) for environmental protection and conservation of biodiversity, social equity and sustainable development.

iv. Acquire values and attitudes towards understanding complex environmental-economic social challenges, and participating actively in solving current environmental problems and preventingthe future ones

RKDF UNIVERSITY RANCHI

DIPLOMA IN MECHANICAL ENGINEERING (DIPLOMA ME)

Branch	Subject Title	Subject Code
Mechanical Engineering	Robotics	DMEO604(E)

Course Objectives:

- To introduce the basic concepts, parts of robots and types of robots.
- To make the student familiar with the various drive systems for robot, sensors and their applications in robots and programming of robots.
- To select the robots according to its usage.

Course Content:

UNIT-I: Fundamentals of Robotics: Introduction; Definition; Robot anatomy (parts) and its working; Robot Components: Manipulator, End effectors; Construction of links, Types of joints; Classification of robots; Cartesian, Cylindrical, Spherical, Scara, Vertical articulated; Structural Characteristics of robots; Mechanical rigidity; Effects of structure on control work envelope and work Volume; Robotwork Volumes, comparison; Advantages and disadvantages of robots.

Unit-II: Robotic Drive System and Controller: Actuators; Hydraulic, Pneumatic and Electrical drives; Linear actuator; Rotary drives; AC servo motor; DC servo motors and Stepper motors; Conversion between linear and rotary motion; Feedback devices; Potentiometers; Optical encoders; DC tachometers; Robot controller; Level of Controller; Open loop and Closed loop controller; Micropro- cessor based control system; Robot path control: Point to point, Continuous path control and Sensorbased path control; Controller programming.

Unit-III: Sensors: Requirements of a sensor; Principles and Applications of the following types of sensors: Position sensors (Encoders, Resolvers, Piezo Electric); Range sensors (Triangulation Principle, Structured lighting approach); Proximity sensing; Force and torque sensing.

Reference Books:

1. Introduction to Robotics: Analysis, Systems, Applications – Saeed B. Niku, Pearson Education Inc. New Delhi 2006.
2. Industrial Robotics: Technology, Programming and Applications – M.P. Groover, Tata McGraw Hill Co, 2001.
3. Robotics Control, Sensing, Vision and Intelligence – Fu.K.S. Gonzalz.R.C and Lee C.S.G, Mc-Graw Hill Book Co, 1987.
4. Robotics for Engineers – Yoram Koren, McGraw Hill Book Co, 1992.
5. A Text book on Industrial Robotics – Ganesh S. Hedge, Laxmi Publications Pvt. Ltd., New Delhi, 2008.

Course outcomes:

At the end of the course, the student will be able to:

1. Explain the robot anatomy, classification, characteristics of robot, advantages and disadvantages.
2. Explain the various robotic actuators on hydraulic, pneumatic and electrical drives.
3. Explain about various types of sensors and concepts on robot vision system.
4. Explain the various applications of robots.

RKDF UNIVERSITY RANCHI

DIPLOMA IN MECHANICAL ENGINEERING (DIPLOMA ME)

Branch	Subject Title	Subject Code
Mechanical Engineering	Green Energy Technology	DMEO605(E)

Course Objectives:

1. To make the student know about different non-conventional energy system.
2. To make analyze the performance and limitations of the solar and wind energy conversion system.
3. To understand the concept behind the bio-mass, geothermal, tidal, ocean thermal and wave energy conversions.
4. To study about the basics of fuel cells and hydrogen production and storage.

Course Outcome:

After successful completion of the course students will be able to:

1. **Identify** different non-conventional energy system and **realize** their importance in today's scenario.
2. **Analyze** the performance and limitations of the solar and wind energy conversion system.
3. **Understand** the concept behind the bio-mass, geothermal, tidal, ocean thermal and wave energy conversions.
4. **Outline** the basics of fuel cells and hydrogen production and storage.

DETAILED SYLLABUS

Module I: Introduction

Basics of energy, conventional energy sources, fossil fuels limitations, renewable energy sources, advantages and limitations, global energy scenario, energy scenario of India, new technologies (hydrogen energy, fuel cells, bio fuels).

Module II: Solar Energy

Theory of solar cells, solar cell materials, I-V characteristics of solar cell, PV module, PV array, MPPT, PV systems, Stand alone and grid connected PV systems, storage, PV based water

pumping, solar radiation and its measurement, flat plate collectors and their materials, applications and performance, solar thermal power plants, limitations.

Module III: Wind Energy

Wind power and its sources, site selection, power in the wind, impact of tower height, classification of wind turbine and rotors, wind energy extraction, betz'z limit, wind characteristics, performance and limitations of wind energy conversion systems.

Module IV: Biomass and Geothermal energy

Availability of biomass and its conversion theory, types of biomass, gasification, biogas plant, biomass cogeneration, resources of geothermal energy, thermodynamics of geo-thermal energy conversion, geothermal power generation, environmental considerations.

Module V: Tidal, Wave and Ocean energy

Introduction to tidal energy, tidal characteristics, tidal power plant, tidal power development in India, introduction to wave energy, factors affecting wave energy, principles of wave energy plant, OTEC, applications of OTEC.

Module VI: Emerging technologies for power generation

Fuel cells, Principle of working of various types of fuel cells and their working, performance and limitations, future potential of fuel cells, emergence of hydrogen, cost analysis of hydrogen production, hydrogen storage.

Suggested Readings:

[1] Non-Conventional Energy Resources, D.S. Chauhan, New Age International Pvt Ltd., 2006.

[2] D. P. Kothari, Rakesh Ranjan, Renewable Energy Sources and Emerging Technologies, PHI,India,2011.

[3] Solar Cells: Operating principles, Technology and Systems Applications, Martin Green, UNSW, Australia, 1997

[4] S. P. Sukhatme, Solar Energy, TMH, India. 2008.

[5] Introduction to Wind Energy Systems: Basics, Technology and Operation (Green Energy and Technology), by Hermann-josef Wagner, ISBN: 9783642020223, Publisher: Springer, September 2009.

[6] Biofuels - Securing the Planet's Future Energy Needs, Edited by A Demirbas Springer 2009

[7] Fuel Cells: The Sourcebook - New Edition 2004 Escovale 2004.

Reference Books:

[1] John Twiden and Tony Weir, Renewable Energy Resources, BSP Publications, 2006.

[2] Renewable Energy, Third Edition, Bent Sorensen, Academic Press August 2004

[3] Wind Energy Explained: Theory, Design and Application, by J. F. Manwell, ISBN: 9780470015001, Publisher: John Wiley & Sons, Publication Date: February 2010 .

[4] L.L. Freris, Wind Energy Conversion Systems, Prentice Hall, 1990.

RKDF UNIVERSITY RANCHI

DIPLOMA IN MECHANICAL ENGINEERING (DIPLOMA ME)

Branch	Subject Title	Subject Code
Mechanical Engineering	Disaster Management	DMEO606(E)

Course Learning Objectives:

Following are the objectives of this course:

- To learn about various types of natural and man-made disasters.
- To know pre- and post-disaster management for some of the disasters.
- To know about various information and organizations in disaster management in India.
- To get exposed to technological tools and their role in disaster management.

Course Content:

Unit – I: Understanding Disaster

Understanding the Concepts and definitions of Disaster, Hazard, Vulnerability, Risk, Capacity – Disaster and Development, and disaster management.

Unit – II: Types, Trends, Causes, Consequences and Control of Disasters

Geological Disasters (earthquakes, landslides, tsunami, mining); Hydro-Meteorological Di- sasters (floods, cyclones, lightning, thunder-storms, hail storms, avalanches, droughts, cold and heat waves) Biological Disasters (epidemics, pest attacks, forest fire);

Technological Disasters (chemical, industrial, radiological, nuclear) and Manmade Disasters (building collapse, rural and urban fire, road and rail accidents, nuclear, radiological, chemi- cals and biological disasters) Global Disaster Trends – Emerging Risks of Disasters – Climate Change and Urban Disasters.

Unit- III: Disaster Management Cycle and Framework

Disaster Management Cycle – Paradigm Shift in Disaster Management.

Pre-Disaster – Risk Assessment and Analysis, Risk Mapping, zonation and Microzonation, Prevention and Mitigation of Disasters, Early Warning System; Preparedness, Capacity De- velopment; Awareness.

During Disaster – Evacuation – Disaster Communication – Search and Rescue – Emergency Operation Centre – Incident Command System – Relief and Rehabilitation –

Post-disaster – Damage and Needs Assessment, Restoration of Critical Infrastructure – Early Recovery – Reconstruction and Redevelopment; IDNDR, Yokohama Stretegy, Hyogo Frame- work of Action.

Unit– IV: Disaster Management in India

Disaster Profile of India – Mega Disasters of India and Lessons Learnt.

Disaster Management Act 2005 – Institutional and Financial Mechanism,

National Policy on Disaster Management, National Guidelines and Plans on Disaster Management; Role of Government (local, state and national),Non-Government and Inter Governmen-tal Agencies

Unit– V: Applications of Science and Technology for Disaster Management

Geo-informatics in Disaster Management (RS, GIS, GPS and RS).

Disaster Communication System (Early Warning and Its Dissemination).

Land Use Planning and Development Regulations, Disaster Safe Designs and Constructions, Structural and Non Structural Mitigation of Disasters

S&T Institutions for Disaster Management in India

References

1. Publications of National Disaster Management Authority (NDMA) on Various Templates and Guidelines for Disaster Management
2. Bhandani, R. K., An overview on natural & man-made disasters and their reduction, CSIR, New Delhi
3. Srivastava, H. N., and Gupta G. D., Management of Natural Disasters in developing countries, Daya Publishers, Delhi
4. Alexander, David, Natural Disasters, Kluwer Academic London
5. Ghosh, G. K., Disaster Management, A P H Publishing Corporation
6. Murthy, D. B. N., Disaster Management: Text & Case Studies, Deep & Deep Pvt. Ltd.

Course outcomes:

After completing this course, student will be:

- Acquainted with basic information on various types of disasters
- Knowing the precautions and awareness regarding various disasters
- Decide first action to be taken under various disasters
- Familiarized with organization in India which are dealing with disasters

Able to select IT tools to help in disaster management

RKDF UNIVERSITY RANCHI

DIPLOMA IN MECHANICAL ENGINEERING (DIPLOMA ME)
New Scheme Based on AICTE Flexible Curricula

Semester–VI

Branch	Subject Title	Subject Code
ME	**Green Building & Energy Conservation**	DMEO609(E)

Course Objectives:

Following are the objectives of this course:

- To know various aspects of green buildings
- To use different steps involved in measuring environmental impact assessment.
- To relate the construction of green building with prevailing energy conservation policy and regulations.
- To know and identify different green building construction materials.
- To learn different rating systems and their criteria.

Course Content:

Unit I : Introduction to Green Building and Design Features

• Definition of Green Building, Benefits of Green building, Components/features of Green Building, Site selection, Energy Efficiency, Water efficiency, Material Efficiency, Indoor Air Quality.

• Site selection strategies, Landscaping, building form, orientation, building envelope and fenestration,

material and construction techniques, roofs, walls, fenestration and shaded finishes,

advanced passive heating and cooling techniques, waste reduction during construction

Unit–II Energy Audit and Environmental Impact Assessment (EIA)

• Energy Audit: Meaning, Necessity, Procedures, Types, Energy Management Programs

• Environmental Impact Assessment(EIA): Introduction, EIA regulations, Steps in environmental impact assessment process, Benefits of EIA, Limitations of EIA, Environmental clearance for the civil engineering projects.

Unit– III Energy and Energy conservation

- Renewable Energy Resources: Solar Energy, Wind Energy, Ocean Energy, Hydro Energy, Biomass
- Energy
- Non-renewable Energy Resources: Coal, Petroleum, Natural Gas, Nuclear Energy, Chemical
- Sources of Energy, Fuel Cells, Hydrogen, Biofuels.
- Energy conservation: Introduction, Specific objectives, present scenario, Need of energy
- conservation, LEED India Rating System and Energy Efficiency.

Unit– IV Green Building

• Introduction: Definition of Green building, Benefits of Green building,

• Principles: Principles and planning of Green building

• Features: Salient features of Green Building, Environmental design (ED) strategies for building construction.

• Process: Improvement in environmental quality in civil structure

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• Materials: Green building materials and products- Bamboo, Rice husk ash concrete, plastic bricks, Bagasse particle board, Insulated concrete forms. reuse of waste material-Plastic, rubber, Newspaper wood, Nontoxic paint, Green roofing

Unit V Rating System

• Introduction to (LEED) criteria,

• Indian Green Building council (IGBC) Green rating,

• Green Rating for Integrated Habitat Assessment. (GRIHA) criteria

• Heating Ventilation Air Conditioning (HVAC) unit in green Building

• Functions of Government organization working for Energy conservation and Audit(ECA)-

• National Productivity council(NPC)

• Ministry of New and Renewable *Energy* (MNRE)

• Bureau of Energy efficiency (BEE)

Suggested learning resources:

1. Kibert, C.J., Sustainable construction: Green Building design and Delivery, John Wiley Hobo-ken, New Jersey.

2. Chauhan, D S Sreevasthava, S K., Non-conventional Energy Resources, New Age International Publishers, New Delhi.

3. O.P. Gupta, Energy Technology, Khanna Publishing House, New Delhi

4. Jagadeesh, K S, Reddy Venkatta Rama & Nanjunda Rao, K S., Alternative Building Materials and Technologies, New Age International Publishers, Delhi.

5. Sam Kubba., Handbook of Green Building Design and Construction, Butterworth-Heinemann.

6. Means R S, Green Building - Project Planning and Cost Estimating, John Wiley & Sons

7. Sharma K V, Venkataseshaiah P., Energy Management and Conservation, IK International.

Course outcomes:

After completing this course, student will be able to:

• Identify various requirements for green building.

• Use different steps in environmental impact assessment.

• Relate the construction of green building with prevailing energy conservation policy and regulations.

• Supervise the construction of green building construction using green materials.

• Focus on criteria related to particular rating system for assessment of particular Green building.

RKDF UNIVERSITY RANCHI

DIPLOMA IN MECHANICAL ENGINEERING (DIPLOMA ME)
New Scheme Based on AICTE Flexible Curricula

Semester–IV

Branch	Subject Title	Subject Code
ME	**Repairs & Maintenance of Structures**	DMEO607(E)

Course Objectives:

Following are the objectives of this course:

• To learn about types of maintenance techniques

• To understand causes of various types of damages.

Civil Engineering Curriculum Structure 124

• To know about relevant materials for repair.

• To learn methods of retrofitting for different structures.

Course Content:

Unit – I Basics of maintenance

• Types of Maintenances - repair, retrofitting, re-strengthening, rehabilitation and restoration.

• Necessity, objectives and importance of maintenance.

• Approach of effective management for maintenance.

• Periodical maintenance: check list, maintenance manual containing building plan, reinforcement details, material sources, maintenance frequency, corrective maintenance procedures and sources. Pre- and post- monsoon maintenance.

Unit– II Causes and detection of damages

• Causes of damages due to distress, earthquake, wind, flood, dampness, corrosion, fire, deterioration,

termites, pollution and foundation settlement.

• Various aspects of visual observations for detection of damages.

• Load test and non-destructive tests (brief description). NDT tests on damaged structure such as rebound hammer, ultrasonic pulse velocity, rebar locator, crack detection microscope, digital crack measuring gauge.

• Chemical test - Chloride test, sulphate attack, carbonation test, pH measurement, resistivity method, Half-cell potential meter (Introduction and demonstration only).

Unit– III Materials for maintenance and repairs

• Types of repair material, material selection.

• Essential parameters for maintenance and repair materials such - bond with substrate, durability.

• Waterproofing materials based on polymer modified cement slurry, UV resistant acrylic polymer, ferro-cement.

• Repairing materials for masonry: plastic/aluminum nipples, non-shrink cement, polyester putty or 1:3 cement sand mortar, galvanized steel wire fabrics and clamping rods, wire nails, ferro-cement plates.

• Repairing materials for RCC: epoxy resins, epoxy mortar, cement mortar impregnated with polypropylene, silicon, polymer concrete composites, sealants, fiber reinforcement concrete, emulsions and paints.

Unit– IV Maintenance and repair methods for masonry Construction

• Causes of cracks in walls - bulging of wall, shrinkage, bonding, shear, tensile, vegetation.

• Probable crack location: junction of main and cross wall, junction of slab and wall, cracks in masonry joints.

• Repair methods based on crack type - For minor & medium cracks (width 0.5 mm to 5mm): grouting and for major cracks (width more than 5mm): fixing mesh across cracks, RCC band, installing ferro-cement plates at corners, dowel bars, propping of load bearing.

• Remedial measures for dampness & efflorescence in wall.

Unit– V Maintenance and repair methods for RCC Construction

• Repair stages such as concrete removal and surface preparation, fixing suitable formwork, bonding/passive coat and repair application, various methods of surface preparation.

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• Repair options such as grouting, patch repairs, carbonated concrete, cleaning the corroded steel, concrete overlays, latex concrete, epoxy bonded mortar and concrete, polymer concrete, corrosion protection such as jacketing.

• Building cracks and its prevention, common methods for dormant crack repairs such as Epoxy

injection, grooving and sealing, stitching, grouting and guniting/ shotcreting.

• Strengthening methods for live cracks such as addition of reinforcements, Jacketing, brackets, collars, supplementary members i.e. shoring, underpinning and propping of framed structure.

Suggested learning resources:

1. Gahlot, P. S., Sharma, S., Building Repair and Maintenance Management, CBS Publishers & Distributors Pvt. Ltd., New Delhi

2. Guha, P. K., Maintenance and Repairs of Buildings, New Central Book Agencies

3. Hutchin Son, B. D., Maintenance and Repairs of Buildings, Newnes-Butterworth

4. Relevant BIS codes

Course outcomes:

After competing this course, student will be able to:

• Decide which type of maintenance is needed for a given damaged structure

• Assess causes of damages various types of structures.

• Select the relevant material for repair of the given structure.

• Apply relevant method of retrofitting for re-strengthening of structures.

• Suggest relevant technique to restore the damages of the given structural elements

RKDF UNIVERSITY RANCHI

DIPLOMA IN MECHANICAL ENGINEERING (DIPLOMA ME)

Branch	Subject Title	Subject Code
Mechanical Engineering	**PLC AND SCADA**	DMEO610(E)

COURSE OBJECTIVES:

1. To get familiar with industrial automation with PLC
2. To get familiar with industrial automation with SCADA
3. Knowing the basics of HMI

UNIT 1

Programmable Logic Controllers: Introduction, Parts of a PLC, Principles of Operation, Modifying the Operation, PLCs versus Computers, PLC Size and Application. PLC Hardware Components: The I/O Section, Discrete I/O Modules, Analog I/O Modules, Special I/O Modules, I/O Specifications, The Central Processing Unit (CPU), Memory Design, Memory Types, Programming Terminal Devices, Recording and Retrieving Data, Human Machine Interfaces (HMIs). Basics of PLC Programming: Processor Memory Organization, Program Scan, PLC Programming Languages, Relay-Type Instructions, Instruction Addressing, Branch Instructions, Internal Relay Instructions, Programming Examine If Closed and Examine If Open Instructions, Entering the Ladder Diagram, Modes of operation

UNIT 2

Developing Fundamental PLC Wiring Diagrams and Ladder Logic Programs: Electromagnetic Control Relays, Contactors, Motor Starters, Manually Operated Switches, Mechanically Operated Switches, Sensors, Output Control Devices, Seal-in Circuits, Latching Relays, Converting Relay Schematics into PLC Ladder Programs, Writing a Ladder Logic Program Directly from a Narrative Description. Programming Timers: Mechanical Timing Relays, Timer Instructions, On-Delay Timer Instruction, Off-Delay Timer Instruction, Retentive Timer, Cascading Timers.

UNIT 3

SCADA Fundamentals: Introduction, Open system: Need and advantages, Building blocks of SCADA systems, Remote terminal unit (RTU): Evolution of RTUs, Components of RTU, Communication subsystem, Logic subsystem, Termination subsystem

UNIT 4

Human-Machine Interface (HMI): HMI components, HMI software functionalities, Situational awareness, Intelligent alarm filtering: Need and technique, Alarm suppression techniques, Operator needs and requirements,

UNIT 5

SCADA Systems: Building the SCADA systems, legacy, hybrid, and new systems, Classification of SCADA systems, SCADA implementation: A laboratory model: The SCADA laboratory, System hardware, System software, SCADA lab field design.

Text Books:

1. Programmable Logic Controllers Frank D Petruzella McGraw Hill 4th Edition, 2011
2. Power System SCADA and Smart Grids Mini S. Thomas CRC Press 3rd Edition,2015

Course Outcomes: students will be able to

1. Do the ladder logic program in PLC
2. Understand the working with PLC and SCADA
3. Analyze the working of HMI

RKDF UNIVERSITY RANCHI

DIPLOMA IN MECHANICAL ENGINEERING (DIPLOMA ME)

Branch	Subject Title	Subject Code
Mechanical Engineering	Wind and Solar Energy Systems	DMEO608(E)

Course objectives:

1. To develop the importance of wind power generation
2. To make the students know the generation of power using wind and solar

UNIT 1: Physics of Wind Power:

History of wind power, Indian and Global statistics, Wind physics, Betz limit, Tip speed ratio, stall and pitch control, Wind speed statistics-probability distributions,

UNIT 2: Wind generator topologies:

Review of modern wind turbine technologies, Fixed and Variable speed wind turbines, Induction Generators, Doubly-Fed Induction Generators and their characteristics, Permanent- Magnet Synchronous Generators,

UNIT 3: The Solar Resource:

Introduction, solar radiation spectra, solar geometry, Earth Sun angles, observer Sun angles, solar day length, Estimation of solar energy availability.

UNIT 4: Solar photovoltaic:

Technologies-Amorphous, monocrystalline, polycrystalline; V-I characteristics of a PV cell, PV module, array, Power Electronic Converters for Solar Systems, Maximum Power Point Tracking (MPPT) algorithms. Converter Control.

UNIT 5: Network Integration Issues

Overview of grid code technical requirements. Fault ride-through for wind farms - real and reactive power regulation, voltage and frequency operating limits, solar PV and wind farm behavior during grid disturbances. Power quality issues.

Course Outcomes:

At the end of this course, students will demonstrate the ability to

1.Understand the energy scenario and the consequent growth of the power generation from renewable energysources.

2.Understand the basic physics of wind and solar powergeneration.

3.Understand the power electronic interfaces for wind and solargeneration.

4.Understand the issues related to the grid-integration of solar and wind energysystems.

Text / References:

1.T.Ackermann,"WindPowerinPowerSystems",JohnWileyand SonsLtd.,2005.

2.G. M. Masters, "Renewable and Efficient Electric Power Systems**",** John Wiley and Sons,2004.

3.S.P.Sukhatme,"SolarEnergy:Principlesof ThermalCollectionandStorage",McGrawHill,1984.

4.H. Siegfried and R. Waddington, " Grid integration of wind energy conversion systems" John Wiley and Sons Ltd.,2006.

5.G.N.TiwariandM.K.Ghosal," RenewableEnergyApplications",Narosa Publications,2004.

6.J. A. Duffie and W. A. Beckman, " SolarEngineering of Thermal Processes", John Wiley & Sons, 1991.

RKDF UNIVERSITY RANCHI

DIPLOMA IN MECHANICAL ENGINEERING (DIPLOMA ME)

Branch	Subject Title	Subject Code
Diploma CSE	Introduction To Artificial Intelligence	DMEO611(E)

The objective of general AI is

- To design a system capable of thinking for itself just like humans do. Currently, general AI is still under research, and efforts are being made to develop machines that have enhanced cognitive capabilities.

Unit-I

Introduction: Overview of Artificial intelligence- Problems of AI, AI technique, Tic - Tac - Toe problem. Intelligent Agents : Agents & environment, nature of environment, structure of agents, goal based agents.

Unit-II

Search techniques : Computer Science & Engineering Syllabus Solving problems by searching :problem solving agents, searching for solutions; uniform search strategies: breadth first search, depth first search, depth limited search, bidirectional search, comparing uniform search strategies. Heuristic search strategies: Greedy best-first search, A* search, memory bounded heuristic search

Unit-III

Knowledge & reasoning : Knowledge representation issues, representation & mapping, approaches to knowledge representation, issues in knowledge representation. Using predicate logic

Unit-IV

Planning : Overview, components of a planning system, Goal stack planning, Hierarchicalplanning, other planning techniques. Natural Language processing : Introduction, Syntactic processing, semantic analysis, discourse & pragmatic processing.

Unit-V

Learning: Forms of learning, inductive learning, learning decision trees, explanation based learning.

Text Books:

- Artificial Intelligence, Ritch & Knight, TMH
- Artificial Intelligence A Modern Approach, Stuart Russel Peter Norvig Pearson
- Introduction to Artificial Intelligence & Expert Systems, Patterson, PHI
- Poole, Computational Intelligence, OUP
- Logic & Prolog Programming, Saroj Kaushik, New Age International
- Expert Systems, Giarranto, VIKAS
- Artificial Intelligence, Russel, Pearson
- Identify problems where artificial intelligence techniques are applicable.
- Apply selected basic AI techniques; judge applicability of more advanced techniques.
- Participate in the design of systems that act intelligently and learn from experience.

Learning Outcomes:

- Design user interfaces to improve human–AI interaction and real-time decision-making.
- Evaluate the advantages, disadvantages, challenges, and ramifications of human–AI augmentation.
- Design and develop symbiotic human–AI systems that balance the information processing power of computational systems with human intelligence and decision making.
- Explain the benefits, limitations, and tradeoffs of designing engaging and ethical conversational user interactions, including those supported by chatbots, smart speakers, and other AI-driven, voice-based technologies.
- Design and evaluate conversational interfaces for different users and contexts of use.